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South Coast Hydrologic Region Summary

This section is under development.

Current State of the Region

Setting

The South Coast Hydrologic Region is California's most urbanized and populous region. More than half of the state's population resides in the region which covers 11,000 square miles or 7 percent of the state's total land. The region extends from the Pacific Ocean east to mountains of the Transverse and Peninsular Ranges, and from the Ventura-Santa Barbara County line south to the international border with Mexico. It includes all of Orange County and portions of Ventura, Los Angeles, San Bernardino, Riverside, and Sana Diego counties (see Figure SC-1).

PLACEHOLDER Figure SC-1 **South Coast Hydrologic Region**

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

The topography of the South Coast Hydrologic Region provides the ideal conditions to accommodate the steady expansion of the residential, commercial, and industrial developments throughout. Yet, there remains sufficient land to sustain the important agricultural operations in Ventura and San Diego counties and the Chino and San Jacinto Valleys. The coastal zone encompasses the Oxnard Plain (or the Ventura Basin), the Los Angeles Basin, and the Coastal Plain of Orange County. These alluvial basins are heavily utilized for urban, agricultural, or a combination of both uses. These same uses are also occurring in the South Coast region's warmer interior basins. They are often separated from their coastal counterparts by hills (Chino Hills) and small to moderately-sized mountain ranges (Santa Ana and the Santa Monica Mountains). Prominent basins include the Ojai, Santa Clarita, Santa Rosa, and Simi Valleys in the Santa Clara Planning Area, San Fernando and San Gabriel Valleys in the Metropolitan Los Angeles area, the Chino Basin and the Pomona, Elsinore, and San Jacinto valleys in the Santa Ana area, and the Carmel and San Dieguito Valleys in the San Diego area.

Prominent mountain ranges provide the northern and eastern boundaries of the region. In the north, there are the San Gabriel Mountains and several mountain ranges known collectively as the Ventura County Mountains which includes the Topatopa Mountains. To the east, there are the San Bernardino, San Jacinto, Borrego, and Vallecito Mountains.

The San Gabriel and San Bernardino mountains are part of the geologic province known as the Transverse Range. From the Oxnard Plain eastward, the topography is dominated by west-to-east trending hills, small to moderate mountain ranges, and valleys. The Los Angeles Basin is part of the province. The uplifted marine terraces in the coastal zone of the San Diego area and the eastern mountain ranges, beginning with the Jacinto Mountains in the north, are part of the Peninsular Range province. Surface runoff to the Pacific Ocean has carved river valleys into the terraces. The freshwater flows in many of the rivers and streams in the area drain into lagoons and marshes along the coast.

Although much of the land in the region is urbanized or is part of agriculture, all or portions of several national and State parks are located in the South Coast region. They are the Los Padres, Angeles, San Bernardino, and Cleveland national forests and Cuyamaca-Rancho and Chino Hills State parks.

Watersheds

There are 19 major rivers and watersheds in the South Coast region (Figure SC-2). Many of these watersheds have densely urbanized lowlands with concrete-lined channels and dams controlling flood flows. The headwaters for many rivers, however, are within coastal mountain ranges and have remained largely undeveloped.

PLACEHOLDER Figure SC-2 Watersheds in the South Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Santa Clara Planning Area Watersheds

The watersheds of the Santa Clara Planning Area provide important habitat and water resources within Ventura and Los Angeles counties. Strategic planning continues to protect remaining ecosystems and water supplies while providing flood protection to existing developments. The major watersheds are the Ventura River, Santa Clara River, and Calleguas Creek (including Oxnard Plain).

Ventura River Watershed

The Ventura River Watershed covers an area of 227 square miles in the mountains of the western Transverse Range. It is located to the north of the cities of Oxnard and San Buenaventura and includes the scenic Ojai Valley. Drainage is provided by the Ventura River, the northernmost major river system in the Region, and its tributaries which include Matilija and San Antonio Creeks. One major reservoir is located in the watershed, Lake Casitas which provides water supplies downstream for local urban and agricultural users. The topography of the watershed is rugged and, as a result, the surface waters that drain the watershed have very steep gradients, ranging from 40 feet per mile at the mouth to 150 feet per mile at the headwaters. The watershed provides habitat for a number of sensitive aquatic species, several of which are endangered or threatened such as steelhead trout. In 2012, the draft Ventura River Watershed Protection Plan was released. It provides guidance on the kind of programs and environmental data required for a comprehensive plan for the watershed.

Santa Clara River Watershed

The Santa Clara River Watershed covers an area of 1,643 square miles. The portion of the watershed in Los Angeles County is also identified as the Upper Santa Clara Watershed which is about 654 square miles in size. The upper portion is bounded by the San Gabriel Mountains to the south and southeast, the Santa Susana Mountains to the southwest, the Liebre Mountains and Transverse Ranges to the northeast and northwest, and extends westward to the Ventura County Line. Elevations range from about 800 feet on the valley floor to about 6,500 feet in the San Gabriel Mountains. The headwaters of the Santa Clara River are at an elevation of about 3,200 feet at the divide separating the Region from the Mojave Desert. The main hydrologic feature in the watershed is the Santa Clara River, which is the largest river system in southern California that remains in a relatively natural state. The river is about 100 miles long and originates in the northern slope of the San Gabriel Mountains in Los Angeles County. From its headwaters, the river travels west, crossing both Los Angeles and Ventura counties before it eventually enters the Pacific Ocean midway between the cities of San Buenaventura and Oxnard. The watershed supports many sensitive aquatic species including steelhead trout. One of the largest tributaries, Sespe Creek, contains most of the River's remnant, but restorable, run of the steelhead trout. Sespe Creek has been designated as a "Wild Trout Stream" by the State of California and supports significant steelhead spawning and rearing habitat. Additionally, the federal Los Padres Wilderness Act of 1992 permanently set aside portions of the creek for steelhead trout protection and designated Sespe Creek as a "Wild and Scenic River". Land use in the watershed exists primarily on the floor of the Santa Clarita Valley. From there, the watershed has a combination of urban and agricultural uses. To meet these demands, a combination of groundwater, imported water (SWP supplies), and some recycled water supplies are utilized. The Santa Clara River Enhancement and Management Plan provides guidance to local stakeholders about the kinds of actions and programs which can help sustain and improve the watershed conditions.

Calleguas Creek Watershed

The Calleguas Creek Watershed covers an area of 343 square miles. Most of the watershed is on the Oxnard Plain, however, it does extend eastward into Los Angeles County, just to the east of the City of Simi Valley. Its main hydrologic feature is Calleguas Creek whose headwaters lie near the City of Simi Valley. Important tributaries include Arroyo Simi, Arroyo Canejo, and Arroyo Santa Rosa. Much of the western portion of the watershed has intense agricultural land use activities. Further east, the agricultural uses decrease and urban uses become more prominent; some undeveloped areas exist throughout the watershed. The creek flows into Mugu Lagoon, one of southern California's few remaining large wetlands which support a rich diversity of fish and wildlife. Ventura County has designated the wetland habitat at Magu as a Significant Biological Resource. The lagoon is adjacent to an Area of Special Biological Significance (ASBS) which also supports a great diversity of wildlife including several endangered birds and one endangered plant species. Natural water flows in Calleguas Creek are intermittent, however, discharges of treated urban and agricultural wastewaters increase the flows. Unfortunately, the increased flows have resulted in sedimentation in the lagoon. Impacts on the aquatic life in both the lagoon and the inland streams have been observed because of the presence of pesticide residues (DDT), PCBs, and some metals. High levels of minerals and nitrates are also common the groundwater beneath the watershed.

Metropolitan Los Angeles Planning Area Watersheds

The watersheds of the Metropolitan Los Angeles Planning Area are heavily urbanized and have issues with urban runoffand the loss of ecosystems. The planning area has four major watersheds: Santa Monica Bay, Los Angeles River, Dominguez Channel, and San Gabriel River. These watersheds begin in the surrounding Santa Monica and San Gabriel Mountains and extend south across the coastal plains into the Pacific Ocean. Extensive watershed scale planning has taken place, including Santa Monica Bay Restoration Plan, Malibu Creek Watershed Management Plan, Los Angeles River Master Plan, Arroyo Seco Watershed Restoration Feasibility Study, Dominguez Watershed Management Master Plan, and San Gabriel River Master Plan.

Santa Monica Bay Watershed

The 200-square mile North Santa Monica Bay watershed is in the Santa Monica Mountains and includes the southwest Los Angeles County and the southeast Ventura County. It is a coalition of several smaller watersheds, including Malibu and Topanga creeks. The topography of the watershed is a combination of steep-slope mountains, coastal sand dunes, and several small basins. Much of the watershed remains undeveloped. There are urban uses, on the northern margin (cities of Calabasas and Hidden Hills in Los Angeles County and Agoura Hills and Westlake Village in Ventura County) and on southern margin (unincorporated Los Angeles County and City of Malibu). Agricultural uses are minimal. Riparian habitats continue to exist because many of the mountainous canyons remain undeveloped.

Malibu Creek Watershed

The Malibu Creek Watershed covers 109 square miles and lays in both Los Angeles and Ventura counties. Most of the watershed lies within the Santa Monica Mountains National Recreation Area which is managed by the National Park Service. The main hydrologic feature is Malibu Creek whose headwaters are in the Simi Hills. Tributaries include Las Virgenes Creek and Medea Creek. The Southern steelhead trout continue to spawn in relatively large numbers in the upper portions of the creek despite a major barrier to upstream migration, Rindge Dam. As it nears the coast, the creek flows into Malibu Lagoon which supports two important plant communities, the coastal salt marsh and coastal strand. The lagoon serves as a refuge for migrating birds (over 200 species of birds have been observed). Oak and riparian woodlands are supported in the Malibu Canyon area. Urban uses and the channelization of several tributaries to Malibu Creek have caused an imbalance in the natural flow regime in the watershed and led to habitat impacts in Malibu Lagoon. Pollutants of concern, many of which are discharged from nonpoint sources, include excess nutrients, sediment, and bacteria.

Ballona Creek Watershed

The 130-square mile Ballona Creek watershed extends from downtown Los Angeles westward to the Pacific Ocean. It is bounded to the north by the Santa Monica Mountains and the south by the Baldwin Hills. Drainage is provided by Ballona Creek and two small tributaries. The watershed is heavily urbanized and includes the cities of Beverly Hills, Culver City, and West Hollywood and portions of the cities of Inglewood, Los Angeles, and Santa Monica. Several environmental sites are located in the western margin of the watershed. These are the Ballona Wetlands, Ballona Lagoon, and Oxford Lagoon. The California Department of Fish and Game, State Coastal Conservancy, and California State Lands Commission are working together to develop a restoration plan for the wetlands. CDFG issued a Notice of Preparation for an EIR to be released on the plan. Ideas for consideration include the establishment of facilities for walking and bird watching and repositioning of the existing levees to help with restoring the native habitat and for flood protection of the urban area around the wetlands.

Los Angeles River Watershed

The 834-square mile Los Angeles River watershed is shaped by the Los Angeles River, which flows from its headwaters in the Santa Monica Mountains, through the San Fernando Valley, south through the Glendale Narrows and across the coastal plain into San Pedro Bay. The river’s major tributaries are the Arroyo Calabasas and Bell Creek (at the river’s origin), Brown’s Canyon Wash, the Burbank Western Channel, Tujunga Wash, Arroyo Seco, Rio Hondo, and Compton Creek. The watershed contains 22 lakes and flood control reservoirs, as well as a number of spreading grounds. Today, over 90 percent of the Los Angeles River is concrete-lined to control surface run-off and reduce the impacts from major flood events. The Los Angeles River Revitalization Master Plan was approved by the City of Los Angeles in 2007. The plan has over 200 proposed projects to rehabilitate the riparian vegetation in certain sections of the River and establish or refurbish landscape areas\parks, bikeways, and pedestrian walkways along the River and in adjoining neighborhoods. Before the plan can be implemented, results are needed from several feasibility studies either underway or planned for the future. One such study is underway by the U. S. Army Corp. of Engineers to determine the feasibility of re-establishing riparian vegetation on the Los Angeles River at different locations.

Dominguez Channel Watershed

The 110-square mile Dominguez Channel watershed, in southern Los Angeles County, is defined by a complex network of storm drains and smaller flood control channels. The Dominguez Channel extends from the Los Angeles International Airport to the Los Angeles Harbor and drains a large portion, if not all, of the cities of Inglewood, Hawthorne, El Segundo, Gardena, Lawndale, Redondo Beach, Torrance, Carson, and Los Angeles. The Dominguez Watershed Advisory Council was formed and is working on a management plan for the watershed. The plan will provide an overview of the (1) conditions in the watershed, (2) problems and issues, and (3) establish targets or goals and provide recommendations on how to achieve them.

San Gabriel River Watershed

The San Gabriel River Watershed covers an area of 640 square miles and is located in eastern Los Angeles County. The watershed is nestled in the southern slopes of the San Gabriel Mountains; a prominent member of the Transverse Range geologic zone. The watershed's main hydrologic feature is the San Gabriel River which flows from north to south. Upper areas of the watershed are undeveloped; large areas of undisturbed riparian and woodland habitats exist although there are flood control dams on the river. In this part of the watershed, the San Gabriel River has a West Fork and East Fork. This part of the river is set aside as a wilderness area. Descending from the mountains, large spreading grounds for groundwater recharge are in operation. The river in the lower part of the watershed has a concrete-lined channel for the protection of people and property in this heavily urbanized sector. The river is once again unlined before entering the Pacific Ocean at the city of Long Beach. The lower watershed encompasses an area that historically consisted of extensive wetlands. A study is underway by The National Park Service to examine the recreational and open space needs for the San Gabriel River Watersheds. Also, the study will identify strategies to protect and enhance the natural resources and environmental habitat. The study is entitled San Gabriel Watershed and Mountains Special Resource Study and is authorized under Public Law 108-042.

Santa Ana Planning Area Watersheds

Urban development in the Santa Ana area was occurring at steady pace until the years just prior to the 2008 financial recession. Open space and agricultural lands were being used to accommodate the growth. Although challenges exist in the Santa Ana Planning Area as related to urban development, water supplies, flood protection, and ecosystem preservation. The planning area consists of one major watershed, the Santa Ana River watershed, and a few subwatershed areas including the San Diego Creek subwatershed and the San Jacinto River subwatershed. Watershed scale planning is provided by the Santa Ana Watershed Project Authority Santa Ana (One Water One Watershed) Integrated Water Resources Management Plan. This plan was supported by a number of subwatershed integrated plans including Central Orange County Integrated Regional and Coastal Watershed Management Plan, North Orange County Integrated Regional and Coastal Watershed Management Plan, Integrated Regional Management Plan for San Jacinto River Watershed, Upper Santa Ana River Watershed Integrated Regional Water Management Plan, and Western Municipal Water District Integrated Regional Water Management Plan.

Santa Ana River Watershed

The Santa Ana River Watershed (Figure SC-3) drains a 2,650 square-mile area. The watershed is home to over 6 million people and includes the major population centers of parts of Orange, Riverside, and San Bernardino Counties, as well as a small portion of Los Angeles County.

The Santa Ana River flows over 100 miles and drains the largest coastal stream system in

PLACEHOLDER Figure SC-3 Santa Ana River Watershed

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Southern California. It discharges into the Pacific Ocean at the City of Huntington Beach. The total length of the SAR and its major tributaries is about 700 miles.

Today, only 20% of the river is a concrete channel, the majority being near the mouth of the river. Discharges from publicly owned wastewater treatment facilities along the river have altered the natural surface flows in the river. The discharges help in providing year-round river flow. As populations have increased, urban runoff and wastewater flows have increased. Between 1970 and 2000, the total average volume rose from less than 50,000 to over 146,000 acre-feet per year (AFY), as measured at the Prado Dam. Base flow is expected to rise to 370,000 AFY by 2025, a projected increase of 153 percent since 1990.

River flow from Seven Oaks Dam to the City of San Bernardino consists mainly of storm flows, flow from the Lower San Timoteo Creek, and rising groundwater. From the City of San Bernardino to the City of Riverside, the river flows perennially and much of the reach is operated as a flood control facility. The principal tributary streams in the upper Watershed originate in the San Bernardino and San Gabriel Mountains. These tributaries include San Timoteo, Reche, Mill, Plunge, City, East Twin, Waterman Canyon, Devil Canyon, Cajon Creeks, and University Wash from the San Bernardino Mountains; and Lone Pine, Lytle, Day, Cucamonga, Chino, and San Antonio Creeks from the San Gabriel Mountains.

River flow in Orange County consists of highly treated effluent, urban runoff, irrigation runoff water, imported water applied for groundwater recharge, and groundwater forced to the surface by underground barriers (SAWPA, March 2004). Near Corona, the SAR cuts through the Santa Ana Mountains and the Peralta-Chino Hills, which together form the northern end of the Peninsular Ranges in Southern California. The SAR then flows down onto the Orange County coastal plain to where the valley floor is reached, and the soft features of the channel where sediment has deposited are more prevalent. Floodplains are strewn with boulders and characterized by sand and gravel washes. Within this valley floor, the transport and depositional processes are less confined by higher terrain as water, dissolved material and sediment move toward the sea. Over time, aquatic and terrestrial wildlife have adapted to this dynamic process and channel formation. However, rapid urbanization has artificially increased the rate of sedimentation and loss of habitat in this part of the watershed, negatively affecting water quality and wildlife habitat.

PLACEHOLDER Photo SC-1 Prado Wetlands Area

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In the southern portion of the Watershed, the regional boundary divides the Santa Margarita River drainage area, which is not part of the Watershed, from that of the San Jacinto River. The San Jacinto River, which is part of the Watershed, starts in the San Jacinto Mountains, runs westerly through Canyon Lake and normally ends in Lake Elsinore. In wet years, the San Jacinto River will overflow the lake and connect with the SAR through the Temescal Wash.

The Orange County coastal plain is composed of alluvium derived from the mountains. Upstream from the Santa Ana Canyon lay Prado Dam and Prado Wetlands; SAR flows are passed through the Prado Wetlands to improve water quality before being used for Orange County Groundwater Basin recharge. Santiago Creek, the only major tributary to the lower SAR, joins the SAR in the City of Santa Ana. Currently, the SAR is a concrete channel from 17th Street in the City of Santa Ana to Adams Avenue in Huntington Beach. The riverbed is ordinarily dry from 17th Street to the Victoria Street Bridge. The Greenville-Banning Channel, which carries stormwater discharge and urban runoff, is channelized to the Victoria Street Bridge where it joins the SAR. Discharge from the Greenville-Banning Channel combines with tidal flow from the Pacific Ocean causing the SAR to be wet from the Victoria Street Bridge to the mouth of the SAR.

The watershed also contains several human-made water storage facilities, including Diamond Valley Reservoir, Lake Mathews, Lake Perris, and Big Bear Lake. Other flood control facilities along the river are Prado and Seven Oaks dams. To support the large population, the watershed is heavily urbanized although some agricultural uses and undeveloped areas remain today. In the upper portion of the watershed, urbanization is a factor in the degradation of sensitive aquatic and riparian habitats and has impacted local water quality. The watershed continues to have riparian, wetland, and other wildlife habitat.

San Diego Creek Watershed

The 112-square mile San Diego Creek subwatershed is in central Orange County, and drains a portion of the area into Upper Newport Bay. It is a subwatershed to the Santa Ana River watershed. Erosion of the creek channels in the watershed have resulted in the sedimentation of the bay and channel basins. For years there have been concerns about declining water quality from sediments, nutrients, pathogens, and toxics. Habitats for many wildlife species are being isolated by new construction that cuts off long-used wildlife corridors.

San Jacinto River Watershed

The 765-square mile San Jacinto River subwatershed is in western Riverside County and is a subwatershed to the Santa Ana River watershed. It extends from the San Bernardino National Forest in the San Jacinto Mountains to Lake Elsinore in the west. Drainage is provided by the San Jacinto River. The lower portion of the watershed is being urbanized while the upper portion is a mixture of high- and low-density urbanization, agriculture, and undeveloped lands.

Other Watersheds

Two other important subwatersheds in the Santa Ana region include the Anaheim-Bay Huntington Harbor (AB-HH) and Lower San Gabriel River/Coyote Creek. The AB-HH watershed encompasses an area of 81 square miles. The main surface water systems that provide drainage in this watershed are the BolsaChica Channel that provides drainage to the Anaheim Bay-Huntington Harbor Complex; and the East Garden Grove-Wintersburg Channel that carries flow to Bolsa Bay and ultimately to Huntington Harbor.

The Lower San Gabriel/Coyote Creek sub-watershed covers an area of 85 square miles and is located in the northernmost portion of the County of Orange. This watershed straddles the county line for Los Angeles and Orange counties in its upper reaches and then continues southward through Orange County until it discharges into the San Gabriel River in Long Beach.

San Diego Planning Area Watersheds

The watersheds of the San Diego Planning Area are generally smaller than in other areas of the South Coast Hydrologic region. These watersheds are being urbanized, resulting in local water quality issues and loss of ecosystems. Local water supplies are limited in these watersheds. The planning area has nine major watersheds: San Juan, Santa Margarita, San Luis Rey, Carlsbad, San Dieguito, San Diego River, Sweetwater, Otay, and Tijuana. These watersheds generally flow east to west, a majority discharging into lagoons that have been designated as ecological reserves. Watershed-scale planning efforts include Santa Margarita Watershed Management Plan, San Dieguito Watershed Management Plan, San Diego River Watershed Management Plan, Otay River Watershed Management Plan, and Tijuana River Bi-national Vision.

San Juan Creek Watershed

The 134-square mile San Juan Creek watershed extends from the Cleveland National Forest in the Santa Ana Mountains of eastern Orange County to the lagoon at the Pacific Ocean near the City of Dana Point. Drainage is provided by San Juan Creek and its tributaries, which include Trabuco and Oso creeks. Modifications have been made for flood control. Urbanization of the watershed is more extensive on the lower end of the watershed. Issues include channelization and poor surface water quality from urban runoff, loss of floodplain and riparian habitat, decline of water supply and flows, invasive species, and erosion.

San Margarita River Watershed

The 750-square mile Santa Margarita River watershed resides in both Riverside and San Diego counties. It extends southwestward from the confluence of Temecula and Murrieta creeks in southern Riverside County to the Pacific Ocean at the US Marine Corps Base Camp Pendleton, north of the City of Oceanside. The lower portion of the watershed and estuary has largely escaped the development typical of the South Coast and are, therefore, able to support a relative abundance of functional habitats and wildlife. The upper portion is one of the fastest growing areas in California. Issues that have arisen include excessive nutrient inputs, erosion and sedimentation, groundwater degradation and contamination with nitrates and other salts, habitat loss, channelization, and flooding.

San Luis Rey Watershed

The 562-square mile San Luis Rey River watershed is in San Diego County and extends westward from the Palomar and Hot Springs Mountains in the Cleveland National Forest to the Pacific Ocean near the City of Oceanside. Drainage is provided by the San Luis Rey River and its tributaries. Most of the river channel remains in its natural state. The river is generally dry but can carry floodflows during winter storms. The other major water feature in the watershed is Lake Henshaw, which impounds water on the San Luis Rey River near its headwaters. Water supplies from the dam are used downstream for urban uses in the City of Escondido and Vista Irrigation District. The eastern portion of the watershed is owned and managed by governmental agencies, local districts, and Native American Tribes. Urban and agricultural land uses occur throughout much of the watershed, with the urban uses concentrated in the lower portion. Agricultural and livestock operations, urban runoff, and sand mining operations, and septic tanks are among the factors in local surface water quality issues. They include high chloride, total dissolved solids (TDS), and bacteria levels.

Carlsbad Watershed

The 210-square mile Carlsbad watershed is in the coastal margin of San Diego County and has six smaller watersheds that all drain separately to the Pacific Ocean. The watershed is extensively urbanized and includes the cities of Oceanside, Carlsbad, Encinitas, Solana Beach, Vista, San Marcos, Rancho Santa Fe, and Escondido. Water quality issues include toxic substances, nutrients, bacteria and pathogens, and sedimentation. The Agua Hedionda, Buena Vista, and San Elijo lagoons are experiencing excessive coliform bacteria and sediment loading from upstream sources.

San Dieguito River Watershed

The 346-square mile San Dieguito River watershed extends westward from the Volcan Mountains to its outlet to the Pacific Ocean, San Dieguito Lagoon near the City of Del Mar. Drainage is provided by the San Dieguito River and its tributaries which include Santa Ysabel and Santa Maria creeks. Over half of the watershed is vacant or undeveloped; however, much of this is zoned for future residential development. There are several important natural areas within the watershed that sustain a number of threatened and endangered species. Among these are the 55-mile-long, 80,000-acre San Dieguito River Park, the 150-acre San Dieguito Lagoon, and five water storage reservoirs including Lake Hodges, Lake Sutherland, and Lake Poway. The San Dieguito Lagoon is especially sensitive to the effects of pollutants and oxygen depletion from restricted or intermittent tidal flushing.

San Diego River Watershed

The 440-square mile San Diego River watershed extends westward from the Volcan and Cuyamaca Mountains through the San Diego urban area to the Pacific Ocean at Ocean Beach. Drainage is provided by the San Diego River and its tributaries which include San Vicente and Boulder creeks. There are four imported-water storage reservoirs within the watershed: El Capitan, San Vicente, Lake Jennings, and Cuyamaca. Famosa Slough is a tidal salt water marsh, which receives water via the San Diego River Flood Control Channel. Beach postings and closures from elevated levels of coliform bacteria were common in the last 10 years due to urban runoff and sewage spills. Excessive groundwater extraction, increasing TDS, and MTBE contamination threatens this limited resource.

Sweetwater River Watershed

The 230-square mile Sweetwater River watershed extends westward from the Cuyamaca Mountains to the San Diego Bay. Drainage is provided by the Sweetwater River. The San Diego Bay, which constitutes the largest estuary along the San Diego coastline, has been extensively developed with port facilities. Similar to other major bays of the region, 90 percent of the original salt marshes have been filled or dredged. Construction of Loveland and Sweetwater reservoirs, as well as extensive local groundwater pumping, has substantially reduced freshwater input to San Diego Bay. Storm water outfalls provide some flows and nutrients to the bay, but not with natural seasonality, timing, frequency, or content.

Otay River Watershed

The 160-square mile Otay River watershed extends westward from the San Miguel Mountains to San Diego Bay. Drainage is provided by the Otay River which flows through the Upper and Lower Otay lakes. These lakes provide water supply, wildlife habitat, and recreational opportunities. Approximately 36 square mile of the watershed is part of the San Diego Multiple Species Conservation Plan (MSCP) effort that provides habitat for endangered plant and animal species. Other important conservation areas include the San Diego National Wildlife Refuge, Rancho Jamul Ecological Reserve, and vernal pools. Water quality concerns include elevated coliform bacteria in the Pacific Ocean receiving waters near Coronado.

Tijuana River Watershed

The 1,700square mile Tijuana River watershed is a bi-national watershed (455 square-miles in the United States and 1,245 square miles in Mexico) on the westernmost portion of the US/Mexico border. The watershed contains three surface water reservoirs, various flood control works, and a National Estuarine Sanctuary. Major drainages include Cottonwood and Campo creeks in the United States, and the Rio Las Palmas system in Mexico. Cottonwood Creek begins about 20 miles north of the international boundary in the Laguna Mountains. Numerous tributaries come together near Barrett Lake, where the creek continues, entering Mexico west of Tecate. The main river returns to the United States near San Ysidro and joins the Pacific Ocean south of Imperial Beach. Poor water quality is a major issue in the Tijuana River watershed. Although discharges from the Tijuana River account for only a small percentage of total gaged runoff to the ocean, it contains the highest concentrations of suspended solids and heavy metals among the eight largest creeks and rivers in Southern California. Surface water quality has been affected by urban runoff from Mexico, and groundwater contamination has occurred as a result of seawater intrusion and waste discharges.

Groundwater Aquifers

This section is under development.

The use of groundwater supplies varies throughout the South Coast Hydrologic Region. Several groundwater basins in the region have legal limitations on the quantities of water which can be pumped annually, usually the safe yield. In addition, some areas have very limited groundwater supplies and must rely on other sources to meet the demands of their customers.

Artificial replenishment involves storing additional water in the basin(s), over and above the natural replenishment. The most common type of artificial replenishment is “spreading” water into open “pits”, or basins, and allowing it to soak into the ground down to the “water table”. Another commonly used method is called “in-lieu” replenishment. This method involves replacing groundwater with another source of water. This corresponding reduction in groundwater pumping results in less water being removed from the basin which effectively acts to replenish the groundwater supply. In the Santa Ana area, spreading basins are used to artificially replenish many of the basins. Figure SC-2 shows the locations of spreading basins in the Upper, Middle and Lower Santa Ana River Watershed.

One challenge to groundwater supplies is contamination, by total dissolved solids (TDS or salinity) and nitrates. Using the Santa Ana area again, these salts accumulate mostly through use and evaporation, but also are introduced to the water supply by way of agricultural fertilizers and septic tanks. Furthermore, other forms of contamination found in the Watershed are TCE, PCE (commonly used solvents) and Perchlorate (fertilizer, fireworks and explosives). All these forms of contamination must be removed using various treatment methods before it can be introduced into the water supply system.

Groundwater is the largest source of water in the Santa Clara Planning Area, providing over 55% of the water supply required in 2009; about 319 TAF. There are 32 groundwater basins in Ventura County, however, most of the supplies are pumped from basins beneath the Oxnard Plain-Pleasant Valley area. These are the Oxnard, Mugu, Hueneme, Fox Canyon, and Grimes Canyon aquifers. In the Los Angeles County portion of the area, groundwater supplies are pumped from aquifers beneath the Santa Clarita Valley and from the Acton Valley Groundwater Basin.

In the Metropolitan Los Angeles area, groundwater supplies account for less than half of the supplies required to meet all demands. In 2009, 613 TAF of groundwater was pumped, a less than 40 percent of the overall supplies needed. Major groundwater basins include: the San Gabriel Valley, San Fernando Valley, and Sylmar groundwater basins which serve intensely urbanized and industrialized inland areas of Los Angeles County; the Central and West Coast Groundwater Basins (Los Angeles Coastal Plain) which serve heavily urbanized coastal portions of Los Angeles County. Pumping operations in these basins are monitored by the courts (adjudication).

The San Fernando and Sylmar basins are in the San Fernando DAU of the Metropolitan Los Angeles area. They are important water sources for the cities of Los Angeles, San Fernando, Burbank, and Glendale. The Sylmar basin is utilized by the cities of Los Angeles and San Fernando. The basin covers an area of 112,000 acres and lies beneath 90 percent of the Upper Los Angeles River watershed. It is bounded on the east by the Verdugo Mountains; on the north by the Little Tujunga Syncline and the San Gabriel and Santa Monica Mountains; on the west by the Simi Hills; and on the south by the Santa Monica Mountains.

The Sylmar basin is in the northern part of the Upper Los Angeles River Area. It consists of 5,600 acres and lies beneath 5 percent of the Upper Los Angeles River Area. It is bounded on the north and east by the San Gabriel Mountains; on the west by a topographic divide in the valley fill between the Mission Hills and the San Gabriel Mountains; and on the south by the Little Tujunga Syncline which separates it from the San Fernando Basin.

In the Santa Ana area, the groundwater basins are used for both storage and water supply. Groundwater supplies are utilized to meet over half of the urban and agricultural demands. In 2009, a little over 700 TAF was pumped. Important basins include the Orange County Coastal Plain, Upper Santa Ana River Valley, Elsinore Basin, San Jacinto Basin, Hemet Valley, and Seven Oaks Valley.

Important aquifers in the San Diego area for the local water agencies are the Mission, Pauma, San Mateo, Santa Margarita, Sweetwater and Warner. The annual average of potable supplies from groundwater over the past five years has been approximately 18,300 AF. Groundwater also is a supply source for numerous private well owners in the San Diego region, but the amount pumped annually cannot be determined.

Ecosystems

Diversity in topography, soils, and microclimates of the region supports a corresponding variety of plant and animal communities. Native vegetation in the region can be categorized into a number of general plant communities including grasslands, coastal sage scrub, chaparral, oak woodland, riparian, pinyon - juniper, and timber – conifer.

Chaparral is the most common type of vegetation association in the Region. It is generally located on steeper slopes and has characteristics which make it highly flammable. Large expanses of chaparral are found in the Santa Monica Mountains, Simi Hills, Santa Susanna Mountains, Verdugo Hills, and San

Gabriel Mountains. Oak woodland is dominant in Thousand Oaks, Lake Casitas, Hidden Valley, Santa Clarita Valley, and elsewhere in the Transverse Mountain Ranges. Grasslands occur in Point Mugu State Park and on the hillsides and valleys of northern Los Angeles.

Riparian vegetation, found along most of the rivers and creeks, consists of sycamores, willows, cottonwoods, and alders. Extensive riparian corridors occur along Piru, Sespe, Santa Paula, Malibu, and Las Virgenes Creeks, and the Santa Clara, Ventura, and San Gabriel Rivers, as well as along other rivers and creeks of the Los Padres and Angeles National Forests. The riparian vegetation provides essential habitat and transportation corridors for wildlife, supporting a great abundance and diversity of species.

Sandy beaches are the most prominent and dominant habitat along the shoreline. Beaches support species of macroinvertebrates such as sand crabs and Pismo clams; they also support surf fish, such as California corbina, barred surfperch, and shovelnose guitarfish. Many sandy beaches are important spawning grounds for California grunion. Intertidal zones include mud flats, tide pools, sandy beaches, and wave-swept rocks. They provide important habitat and breeding grounds for a variety of plants such as marine algae, fish such as grunion, and many invertebrates. Both beaches and other intertidal zones are important nesting and feeding grounds for migratory waterfowl and shore birds.

Because of the existence of off-shore kelp beds, tidepools, and significant ecological diversity, the nearshore areas between the Ventura County line and Latigo Point was designated by the State Water Resources Control Board as an ASBS which is afforded special protection for marine life to the extent that waste discharge are prohibited within the areas. Additionally, both Ventura and Los Angeles Counties have officially designated unique inland habitat areas which are described in detail in the counties' respective General Plans.

Urbanization and development have resulted in the loss of habitat and a decline in biological diversity. As a result, several native flora and fauna species have been listed as rare, endangered or threatened. Representative examples of endangered species include: California condor, American peregrine falcon, California least tern, tidewater goby, unarmored threespine stickleback, Mohave ground squirrel, conejo buckwheat, many-stemmed Dudleya, least Bell's vireo, and slender-horned spine flower.

Key ecosystems in the Santa Clara Planning Area include the aquatic and riparian habitats along Ventura and Santa Clara Rivers and their tributaries and estuaries. The primary goal of the Watersheds Coalition of Ventura County is to bring together stakeholders to develop integrated watershed management strategies and coordinate ecosystem restoration efforts to achieve long term sustainability of local water resources. Ongoing projects and programs include land acquisition for protection and restoration of habitat and ecosystem restoration projects which remove barriers to steelhead passage, restore sediment transport and natural hydrologic regimes on the river, restore riparian and wetland habitats, and remove the invasive giant reed (*Arundo donax*) from local rivers and tributaries.

The major or significant ecosystems found within the Upper Santa Clara River Watershed include the Santa Clara River, Aliso Canyon, Soledad Canyon, the Santa Clarita Valley, Castaic Valley, San Francisquito Canyon, Bouquet Canyon, Placerita Canyon, and Hasley Canyon. This complex topography provides a natural setting that supports a diverse assemblage of biotic communities. As one of the last free-flowing natural riparian systems remaining in Southern California, the Santa Clara River provides breeding sites, traveling routes and other essential resources for wildlife, thereby contributing to the great diversity and abundance of organisms in the Region. The Upper Santa Clara River Region is home to a range of endangered, threatened and rare species, including fish species such as unarmored threespine stickleback (Gasterosteusaculeatuswilliamsoni).

The natural ecosystem, comprised of a wide variety of biological resources (plant and animal species), as well as physical attributes (land, water, air and other important natural factors), is a vital resource contributing to the economic and physical well-being of the communities of the Upper Santa Clara River Watershed.

Key ecosystems in the Metropolitan Los Angeles Planning Area include intermittent canyons in the inland San Gabriel Mountains and coastal Santa Monica Mountains. Because of extensive development in the Los Angeles area, the physical and hydrologic landscape has been irreversibly altered. Nevertheless, opportunities for aquatic and riparian restoration, wetlands enhancement, and habitat creation are being actively pursued. Ecosystem protection efforts are under way in the San Gabriel River headwaters in Angeles National Forest.

Key ecosystems in the Santa Ana Planning Area include the upper Newport Bay and the constructed wetlands behind Prado Dam. Seven Oaks Dam, and Hemet/San Jacinto. The Santa Ana Watershed Project Authority (SAWPA) is responsible for many important projects underway or under development within the Santa Ana watershed, including its 93-mile Inland Empire Brine Line previously referred to as the Santa Ana Regional Interceptor (SARI) pipeline designed to convey non-reclaimable, high-saline brine out of the watershed, non-native plant removal program, constructed wetlands, wetland expansion, habitat restoration, and wildlife conservation and enhancement. Environmental groups such as the Orange County Coastkeeper are working to restore ecosystem function and improve water quality within coastal marshes. In Orange County's developed watersheds, restoration activities include the removal of debris and trash, reversion to natural channel configuration, revegetation with native species, and a regional invasive species removal program. Many projects contain a public education component intended to integrate public outreach and education of outlying neighborhoods, as well as of visitors to the restoration site.

Key ecosystems in the San Diego Planning Area include coastal lagoons and wetlands, perennial rivers and streams, upland scrub, native grasslands and native woodlands. San Diego’s vegetation communities support a wide array of wildlife species and are home to dozens of sensitive plant species, many of them endemic to the region. Ongoing, large-scale habitat conservation efforts by local, state, and federal agencies have resulted in the permanent protection of many thousands of acres of these ecosystems. Land acquisition and management to preserve biologically sensitive resource areas (including watershed buffers around reservoirs for source water protection, and wildlife corridors) are underway throughout the San Diego area. These preservation efforts are being coupled with conservation agreements that provide protections for sensitive habitats and species well in advance of anticipated impacts from future development. Frequently, large scale land preservation results in regional public recreational amenities, such as the San Dieguito River Park or the Elfin Forest Recreational Reserve, which also provide watershed protection benefits. However, invasive species (such as the quagga mussel, giant reed, and caulerpa algae) remain a major threat to native species. Local environmental organizations, in concert with public agencies, continue to work diligently to identify and restore infested areas.

Flood

Flooding in the South Coast region is predominately from winter storms. Precipitation over short periods can produce large amounts of water in the steep upper watersheds, often leading to very sudden and severe flooding of developed lowland areas. Debris flows are also a common occurrence during the winter months. Seasonal fires denude the watersheds of their vegetation, and can leave steep terrain vulnerable to winter storms. Thunderstorms are infrequent in the region and typically only occur at lower elevations during the winter months. Very little snow makes its way into this region and therefore has a marginal impact on flood events.

Since 2000, the South Coast region has had several significant brush fire events including two in the San Bernardino Mountains (Old and Cedar) and one in the San Gabriel Mountains (Station). The loss of the large acres of native trees and shrubs posed a significant problem for debris basins. This has prompted both State and local governments to request assistance from FEMA for large scale debris basin cleanout operations.

Representative hazards currently facing the region are listed below (for specific instances, see Challenges).

- Some existing culverts and channels do not have sufficient capacity to carry flood waters resulting from the event having 1 percent probability of occurrence in any year.
- Flood infrastructure is aging, leading to deterioration and costly maintenance.
- Population growth and the ensuing development increase the area of impervious surface without sufficient mitigation, increasing peak runoff.
- Development occurs in the floodplain of the 1 percent event without sufficient mitigation, causing increased flood damage risk.
- Development has resulted in poorly placed, flood-vulnerable structures.
- Unmanaged vegetation has reduced flood flow capacity at some locations.
- Clogged rivers, channels, and conveyance structures exacerbate flood risk.
- Existing properties are vulnerable to uncontrolled hillside sheet flow.
- Reservoir siltation has reduced flood storage capacity.
- Some debris basins do not have adequate capacity to capture the anticipated-mudflows.
- Some dams do not meet current State seismic, spillway or other structural requirements.
- Wildfires may denude steep slopes, which are then vulnerable to increased runoff and debris flow during ensuing storms.

Climate

The coastal and interior sections of the South Coast region feature Mediterranean climates characterized by mild, wet winters and warm, dry summers. The bordering mountains have climates that range from Mediterranean to subtropical steppe, with greater ranges of maximum and minimum temperatures and higher precipitation amounts for all seasons. Most of the region’s precipitation (75 percent) falls between December and March. A geographic variability does exist in the region for both temperature and precipitation. Because of topography and distance from the ocean, the interior basins are often much warmer in the summer and cooler during the winter than the coastal basins. Annual rainfall totals in the coastal and interior basins generally decrease from north to south, higher totals do occur in the mountains. The eastern and southern sections can be impacted in the late summer by monsoonal thunderstorms. The region generally experiences substantial climactic variability, with periods of higher than normal precipitation followed by lower than normal precipitation. Periodic drought conditions present a challenge to water providers throughout the region as they attempt to meet growing demands for water.

Table SC-1 was compiled from data collected by CIMIS weather stations to compare annual maximum and minimum temperatures and annual precipitation amounts between 2005 and 2010. The average maximum and minimum temperatures remained fairly stable during the period. However, the period was bookended by years of above average rainfall. Very dry years occurred in 2007 and especially 2009.

PLACEHOLDER Table SC-1 South Coast Hydrologic Region Yearly Regional Temperature and Precipitation

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Demographics

Population

In 2010, total population for the South Coast Hydrologic Region was 19,580,000. The population in the region represented about 53 percent of the total population in the State for that year. About 47 percent of the regional total was in the Metropolitan Los Angeles Planning; 9,165,000 in 2010. The Santa Ana area represented about 28 percent of the regional total; 5,421,000 in 2010. Since 2000, the net growth of the region has been 1.4 million people.

The South Coast region has both the State's largest and smallest cities. In 2010, the City of Los Angeles, the State's largest city, had a population of about 3,793,000. The City of Vernon had a population of 112 in 2010.

The financial recession did impact population growth. Although many cities in the region experienced growth between 2008 and 2010, some cities remained relatively stable while several others lost population.

Tribal Communities

There are approximately 25 Native American Tribes within the South Coast Hydrologic Region (shown in Box SC-1, Water Plan Update 2009). All are located in the Santa Ana and San Diego Planning Areas. The tribes are unique in how they manage and use their water supplies. The following reservations are: Campo, La Posta, Manzanita, Cuyapaipe, Santa Ysabel, Los Coyotes, Pala, Cabazon, Santa Rosa, Morongo, San Manuel, Soboba, Ramona, Pechanga, Pauma, La Jolla, Rincon, San Pasqual, Mesa Grande, Inaja, Barona, Capitan Grande, Viejas, Sycuan, and Jamul reservations. Located within the vast region, lies numerous watersheds that traverse Tribal lands.

Land uses on these reservations include agriculture, urban development, industrial, and culturally sensitive areas. Climate change , land use development (within or adjacent to reservations), agriculture activities, environmental regulations, increasingly stringent water quality objectives, and potential catastrophic events such as earthquakes, extreme drought conditions and floods are challenging to Tribes as they face numerous uncertainties and challenges to provide reliable water supplies to their lands. Also, the desire to protect the high quality groundwater resources for domestic use and to control the pollution of surface water resources is paramount.

Senate Bill 18 (Chapter 905, Statues of 2004), requires cities and counties to consult with Native American Indian Tribes during the adoption or amendments of local general plans or specific plans. A contact list of appropriate Tribes and representatives within this region is maintained by the Native American Heritage Commission. A Tribal Consultation Guideline prepared by Governor's Office of Planning and Research is available online at: http://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf

Soboba Band of Luiseno Indian Reservation is within the Santa Ana Watershed boundaries. The Soboba Indian Reservation was established by an Executive Order that set aside 3,172.03 acres of land for their permanent occupation and use. Located at the foothills of the San Jacinto Mountains in Riverside County, the reservation has deep canyons and rolling hills. It is 1,600 feet above sea level beginning at the San Jacinto River, which borders the Reservation's western boundary to about 2,600 feet in the northeastern and southern portions.

Although the Soboba Reservation is entirely in the Santa Ana Watershed, several other Indian Tribes border the watershed. Though not limited to, in the past, the Morongo, San Manuel, Pechanga, Cahuilla and Ramona tribes have lived on other lands and traveled to the watershed for cultural reasons.

The Pala Band of Mission Indians live in northern San Diego County within the San Luis Rey watershed. The 12, 273 acre reservation is home to the Cupeno and Luiseno people. The Pala Band of Mission Indians have expressed that the priorities for the tribe are climate change adaptation related to water, preparing for water scarcity, drought, and water conservation.

Currently, Tribal landholdings located in this region include the Barona, Campo, Capitan Grande, Highland (Serrano), Inaja-Cosmit, Jamul, La Jolla, La Posta, Mesa Grande, Pechanga, Pala, Pauma-Yuima, Poway (San Luis Rey), Ramona, Rincon, Riverside (Sherman Indian Museum), San Fernando (Fernando Tataviam), San Manuel, San Pasqual, Santa Ana (Juaneno/Acjachemem), Santa Ysabel, Soboba, Sycuan, and Viejas reservations, Rancherias, and communities. On the boundary with the Colorado River region are the Cahuilla, Ewiiaapaayp (Cuyapaipe), Los Coyotes, Manzanita, and Santa Rosa reservations.

Disadvantaged Communities

The State of California defines a Disadvantaged Census Tract as a census tract with a household income less than 80% of the California State median household income. They also define a Severely Disadvantaged Census Tract as a census tract with a household income less than 60% of the California State median household income. In 2007, the California median household income was $58,361 as reported by the U.S. Census Bureau (USCB, 2007).

Approximately 69% of the cities/communities within the Santa Ana Planning Area are therefore considered disadvantaged or contain disadvantaged communities. The Santa Ana Planning Area contains some of the State's poorest residents. In 2000, the per capita income of portions of the Inland Empire was about 25% below the State average (Schreiber, 2003). In addition, based on 2000 U.S. Census data, the San Gabriel and Lower Los Angeles Rivers Watershed Region has 17 of 68 cities that qualify as a disadvantage community and approximately 1.6 million out of 4.7 million (or 40%) of its population lives within a disadvantaged community.

Land Use Patterns

As previously stated, the South Coast Hydrologic Region continues to hold allure, containing more than half of the State's population. This is in large measure owing to two factors: 1) a mild temperature regime and relatively light annual precipitation, and 2) miles and miles of plains and valleys interrupted by mostly gently rolling hills and divides. Urban development continues to encroach on what remains of a once-great agricultural industry. The expansion of urban land uses is focused in the Inland Empire (western sections of Riverside and San Bernardino counties) and on the coastal and interior basins of Orange, Ventura, and San Diego counties. Preservation of open space in the region's urban environment is still important and local governments have taken actions to create and manage wetlands, reservoir sites, regional parks, and riparian corridors. Maintenance of preserved open space in the region's interior mountains continues to be a priority, as well. There are numerous Native American reservations in the South Coast Region, including large units in Riverside and San Diego counties.

As remaining acres of buildable land decreases in Los Angeles and Orange counties, developers have increasingly turned their attention to the other counties in the region. Demand for homes by a burgeoning pool of prospective buyers, with an eye on the difficult economy, has allowed more development to occur in the interior portions of the region than ever before. Although the Inland Empire and the interior basins and valleys of Ventura, Orange, and San Diego counties have experienced continued conversion of agricultural land to urban uses, the rapid changes of the first decade of the 21st century have slowed because of the recession. However, the pace of urbanization will undoubtedly pick up again in the future, and impacts on the environment and quality of life will once more present significant challenges to land use and water resources planning in the South Coast region.

Planted and harvest acres of irrigated crops continues to decrease in the South Coast region. Between 2005 and 2009, the planted acres decreased from 226,300 acres to 216,890 acres in 2009; about 4 percent. Although agricultural land use activities have withered to just a whisper of what it used to be in Los Angeles and Orange counties, they remain robust in Ventura, Riverside, San Bernardino, and San Diego counties, albeit on the decline. On the Oxnard Plain and on the floodplain of the Santa Clara River, in the Santa Clara area, an estimated 109,580 acres of crops were planted and harvested in 2009. This includes 47,300 acres of truck and vegetable crops and 57,800 acres of citrus and subtropical fruit such as lemons and avocados. Table SC-2 shows the major crops grown in the South Coast region.

PLACEHOLDER Table SC-2 South Coast Hydrologic Region Top Crops 2009 (in acres)

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

The State's most important center for avocado production is located in the hills of the San Diego area, around the cities of Escondido and Fallbrook. In 2009, this area had 55,800 acres of citrus and subtropical orchards in production, including avocados. In addition, there was 13,600 acres of vegetable and truck crops planted in several coastal and valley locations. The wine industry cultivated 2,380 acres of vineyards, mostly near the City of Temecula.

The region also has a very robust nursery industry. San Diego County is the State's leading producer of both flowers and foliage, it has slightly more than 50 percent share of total gross sales. The county also has more than 27 percent of the State's nursery products.

In the Santa Ana Planning Area, there was 16,000 acres of citrus and subtropical fruit orchards, 11,000 acres of truck and vegetable crops, and over 5,000 acres of pasture and field crops planted and harvested in 2009. There are lands in the area which have been set aside as agricultural preserves, however, these areas are under constant pressure by the encroachment of surrounding urban lands. The dairy industry remains strong near the cities of Chino, Norco, and Ontario with alfalfa and other forage crops being planted and harvested in the fields adjacent to facilities. Potatoes and other vegetable crops are holding on in the San Jacinto Valley near the City of Hemet. Orange and grapefruit orchards remain in production near the cities of Redlands, Riverside, and Hemet.

The South Coast's watersheds typically do not resemble their natural state because of urbanization and agricultural practices that have modified waterways and surrounding habitats. Numerous waterways have been impacted by the hydro-modification and channelization. Many streambeds have been lined with concrete to facilitate flood management, thereby decreasing groundwater recharge. This is a particular problem for those groundwater basins which have historically been over-pumped, such as in the Los Angeles River watershed. Bridges and other structures over channelized streams can slow flow velocity and cause adjacent flood damage, as seen in the Calleguas Creek watershed. Because of intense urbanization and loss of natural habitat, there is a focus on conserving the natural areas that remain within the region.

Concern over effective land use planning for reducing wildfire risk and ensuring rapid response strategies has become more urgent as development continues to move into urban interface areas. Fires have always been a component of life in California, but the likelihood of fire causing profound damage for local residents has increased with ongoing urbanization. Planners and legislators are increasingly looking to understand and manage the South Coast landscape to reduce such losses.

Regional Resource Management Conditions

Water in the Environment

Given the arid nature of the region and the flashy nature of storm events, the native South Coast environment is generally very sensitive to water. Although numerous structures have been built to alter the natural flows of local water bodies, many efforts are under way to restore these damaged environments, protect existing ones, and develop new ones to replace those that have been lost.

Water supply dedicated to environmental management includes instream flows for fisheries, aquatic vegetation, and water quality protection. Although environmental water use is limited in the South Coast region, local agencies have developed beneficial reuse programs for reclaimed water. Managed wetlands—e.g., Balboa Lake in the Sepulveda Basin area of Los Angeles County, Hemet/San Jacinto Multi-Purpose Constructed Wetlands in Riverside County, San Jacinto Wildlife Area in Riverside County, San Joaquin Marsh along San Diego Creek in Orange County, and Santee Lakes in San Diego—are maintained through discharge of reclaimed water supplies. Discharges from upstream wastewater treatment plants (WWTPs) contribute inflows to many of the region's coastal lagoons and estuaries. Constructed wetlands along the Santa Ana River, including lands behind Prado Dam, have effectively demonstrated the ability to reduce nitrogen levels and recharge the groundwater aquifer. These managed wetlands, fed by Santa Ana River flows, provide for migratory and resident waterfowl and shorebird habitat, wildlife diversity, and public education and recreation opportunities. The source of the wetland flows is assured by the Santa Ana River Stipulated Judgment (overseen by the Santa Ana River

Watermaster) which requires minimum average annual flows and guaranteed TDS concentrations within the river.

A 31-mile section of Sespe Creek in the Los Padres National Forest (Ventura County) was designated by USFWS as a Wild and Scenic River in 1992. Unusual geologic formations, gorges, and riparian vegetation provide excellent scenic diversity and recreation opportunities. This stream is considered a rainbow trout fishery and provides critical habitat for the endangered California condor. Sespe Creek and Bear Creek/Bear Valley Dam (impounding Big Bear Lake) are both designated as "wild trout waters" by DFG and are further regulated to maintain appropriate instream habitat conditions (DFG 2008). These South Coast fisheries are limited by diversions and dams that have cut off important spawning areas through diminished flows and poor water quality.

Water Supplies

To meet current and growing demands for water, the South Coast region is leveraging all available water resources: imported water, water transfers, conservation, captured surface water, groundwater, recycled water, and desalination. Given the level of uncertainty about water supply from the Delta and Colorado River, local agencies have emphasized diversification. Local water agencies now utilize a diverse mixture of local and imported sources and water management strategies to adequately meet urban and agricultural demands each year. For example, San Diego is projected to produce approximately 180,000 acre-feet per year of local supplies through water recycling, desalination, groundwater, and surface storage programs by 2030. By 2021, the area will receive an additional 277,700 acre-feet per year due to San Diego County Water Authority-Imperial Irrigation District (SDCWA-IID) water conservation, transfer, and canal-lining programs. This diverse mix of sources provides flexibility in managing resources in wet and dry years. For an overview of the region's flow of water see Figure SC-4.

PLACEHOLDER Figure SC-4 South Coast Hydrologic Region Inflows and Outflows

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Surface Water

Reservoirs in the South Coast Hydrologic Region provide storage from surface runoff from local watersheds or water supplies imported through the SWP, Colorado River Aqueduct, or the Los Angeles Aqueduct. Flood control structures capture local runoff and some direct them to groundwater recharge facilities.

In the Santa Clara Planning Area, surface water supplies come from Lake Casitas (254,000 acre-feet), Lake Piru (100,000 acre-feet), and from diversion projects along the Santa Clara River, Ventura River, Santa Paula Creek, Piru Creek, Sespe Creek, and Conejo Creek. Natural surface flows from these diversions are also directed to spreading basins to replenish local aquifers. The most southern reservoir on the West Branch of the SWP California Aqueduct is Castaic Lake. Bouquet Reservoir is a part of the Los Angeles Aqueduct (LAA) system built by the City of Los Angeles in 1934.

In the Metropolitan Los Angeles area, flood control dams, operated by the Los Angeles County Department of Public Works, on the Los Angeles River and San Gabriel River have dual uses. They protect life and property along each river and store runoff from the storms for groundwater recharge. The

Los Angeles Reservoir is operated by the LADWP and stores the imported water supplies from the Los Angeles Aqueduct. Las Virgenes MWD uses Las Virgenes Reservoir to store treated water it has purchased from Metropolitan.

Several important water storage reservoirs are in the Santa Ana Planning Area. This includes the terminus reservoir for the SWP, Lake Perris, and the Metropolitan Water District of Southern California – owned Lake Mathews and Diamond Valley Reservoirs. Big Bear Lake, Canyon Lake, and Lake Irvine are smaller facilities, but just as important. They impound the surface runoff from their respective watersheds and are used to meet local urban water demands. Lake Elsinore is used exclusively for recreation; it is not used as a potable water supply.

The San Diego Planning Area has a total of 25 reservoirs with seventeen connected to the San Diego Aqueduct. Major supply reservoirs include San Vicente, El Capitan, Lake Henshaw, and Lake Morena with the latter two facilities receiving their supplies from surface runoff from the surrounding watersheds. Vail Lake is owned and operated by the Rancho California Water District. Water supplies are used for groundwater replenishment.

Groundwater

Adjudicated groundwater basins exist in the Metropolitan Los Angeles and Santa Ana Planning Areas of the South Coast region. These are the: Central, Chino, Cucamonga, Main San Gabriel, Puente, Raymond, San Bernardino, Santa Margarita River, Santa Paula, Six Basins, Upper Los Angeles River, and the West Coast. Additional management of groundwater has been afforded through legislation to: Fox Canyon Groundwater Management Agency (GMA), Ojai GMA, Water Replenishment District of Southern California (WRD), and OCWD.

Groundwater is the largest single source of water in the Santa Clara Planning Area. The 66,200-acre Upper Santa Clara River Valley basin is comprised of two aquifers (an alluvial aquifer and a Saugus Formation aquifer) totaling approximately 1.9 million acre-feet of storage capacity. Because of extensive pumping by private well owners and by a majority of the 166 public water purveyors within Ventura County, overdraft and seawater intrusion problems were occurring to local groundwater basins. Established in 1982 by State legislation, the Fox Canyon GMA now manages some of the basins and is implementing actions to mitigate these issues. The 125,300-acre Lower Santa Clara River Valley basin is subdivided into five smaller basins: Oxnard, Mound, Santa Paula, Fillmore, and Piru. The largest of the sub-basins is the 58,000-acre Oxnard basin, which contains approximately 7.1 million acre-feet of storage capacity and is managed by the Fox Canyon GMA. Conjunctive use projects underway in Ventura County include Calleguas Conjunctive Use Program (North Las Posas Basin).

Many agencies in the Metropolitan Los Angeles Planning Area rely on artificial recharge, by diverting local supplies from rivers or creeks when flow conditions are optimal, to spreading grounds (or basins) which typically contain sandy soils that promote infiltration. LADWP, in conjunction with the Los Angeles County Flood Control District, is moving forward with several storm water capture projects with the goal of increasing long-term groundwater recharge by a minimum 20,000 acre-feet per year. In addition, recycled water is infiltrated in spreading grounds and injected (along with imported water) along the coast to form barriers to seawater intrusion at three locations (the Alamitos, Dominguez Gap, and West Coast barriers). The 310,900-acre Coastal Plain of Los Angeles County basin is subdivided into 4 sub-basins: Santa Monica, Hollywood, Central, and West Coast. The Central and West Coast sub-basins represent almost 90 percent of the storage of the Coastal Plain basin and are both adjudicated for allowed pumping of up to 281,000 acre-feet per year. These sub-basins have a combined total storage capacity estimated at 20.3 million acre-feet and up to 450,000 acre-feet set aside for the development of future conjunctive use projects. Conjunctive use projects underway in Los Angeles County include Long Beach Conjunctive Use Storage Project (Central Basin).

Groundwater continues to be the primary water supply source in the Santa Ana Planning Area. Groundwater production is supported by incidental and artificial recharge of recycled water, imported water, and storm water supplies. On average, about 80,000 acre-feet per year of imported supplies from Metropolitan are recharged each year to support groundwater production. The 466,900-acre Upper Santa Ana Valley basin has nine sub-basins: Chino, Cucamonga, Rialto-Colton, Riverside-Arlington, Cajon, Bunker Hill, Yucaipa, San Timoteo, and Temescal. Total combined storage of the sub-basins is estimated at 21 million acre-feet. Groundwater pumping operations in the Chino, Bunker Hill, and Rialto-Colton sub-basins are managed under adjudication judgments. The 224,000-acre Coastal Plain of Orange County basin has a storage capacity of 37.7 million acre-feet. The Orange County groundwater basin, managed by OCWD, provides a majority of the water used by north and central Orange County cities. Conjunctive use of surface water and groundwater is a long-standing practice in the region, with numerous spreading grounds developed to recharge the basins. Construction was completed for OCWD and Orange County Sanitation District's Groundwater Replenishment System, which treats 70,000 acre-feet per year of wastewater for groundwater storage either by injection along the seawater barrier or by percolation near the Santa Ana River. Conjunctive use programs underway in San Bernardino County include IEUA Cyclic Storage Agreement (Chino Basin) and Three Valley Municipal Water District Cyclic Storage Agreement (Main San Gabriel Basin).

Groundwater production in the San Diego Planning Area is limited by lack of storage capacity in local aquifers, availability of groundwater recharge, and degraded water quality. The local groundwater basin in and around the City of Temecula benefits from recharge of storm water runoff stored in Vail Lake, which is operated by the Rancho California Water District. Desalination of poor quality groundwater continues with a desalting facility operated by the City of San Juan Capistrano.

Imported Water

Water is brought into the South Coast region from three major sources: the Sacramento-San Joaquin Delta, Colorado River, and Owens Valley/Mono Basin. All three are facing water supply cutbacks because of climate change and environmental issues. Althoughimported water supplies historically served to help the South Coast region grow, today it is relied on to sustain the existing population and economy. As such, parties in the South Coast region are working closely with other regions, the State, and federal agencies to address the challenges facing these imported supplies. Meanwhile, the South Coast region is working to develop new local supplies to meet the needs of future population and economic growth.

DWR administers long-term imported water supply contracts with 29 agencies for SWP supplies. In return for State financing, operation, and maintenance of SWP facilities, the agencies contractually agree to repay all associated capital and operating costs. LADWP owns and operates the LAAs for conveyance of imported water from the Owens Valley to the City of Los Angeles.

The Colorado River is managed and operated by USBR under numerous compacts, federal laws, court decisions and decrees, contracts, and regulatory guidelines collectively known as the "Law of the River"

(Table SC-3). This collection of documents apportions the water and regulates the use and management of the Colorado River among the seven basin states and Mexico. Metropolitan, the largest SWP contractor and primary South Coast wholesaler, delivers an average of 1.4 million acre-feet or more of SWP and CRA supplies (depending on the availability of surplus water) to its 26 cities, water districts, and a county authority.

Imported water supplies through the Colorado River are based on the agreements in the 1931 California Seven-Party Agreement and the Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement of 2003 (Table SC-3)

Legal decisions regarding environmental concerns in the Delta have recently limited the volume of water that can be delivered south of the Sacramento-san Joaquin Bay Delta through the SWP.

PLACEHOLDER Table SC-3 Key Elements of the Law of the Colorado River

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Water Transfers

State Water Project

The State Water Project (SWP) is an important source of water for the South Coast region's wholesale and retail suppliers. SWP contractors in the region take delivery of and convey the supplies to regional wholesalers and retailers. Contractors in the region are the Metropolitan Water District of Southern California (Metropolitan), Castaic Lake Water Agency (CLWA), San Bernardino Valley Municipal Water District (MWD), Ventura County Watershed Protection District (VCWPD) (formerly Ventura County Flood Control District), San Gorgonio Pass Water Agency (SGPWA), and San Gabriel Valley Municipal Water District. Metropolitan's contract with the California Department of Water Resources (DWR) is for 1.91 million acre-feet annually; about half the total project.

Legal decisions regarding environmental concerns in the Delta, however, have recently limited the volume of water that can be delivered south of the Sacramento-San Joaquin Bay Delta through the State Water Project (SWP). The potential impact of further declines in ecological indicators in the Delta system on SWP water deliveries is unclear. Additionally, the SWP is subject to extreme variability in hydrology due to a lack of storage, with full deliveries in only the wettest years. Other obstacles that must be overcome in importing water through the SWP include limitations on the movement of water across the Delta system, constraints related to water quality, and the cost of the water. The Governor's Delta Vision Strategic Plan (2008) recently recommended two co-equal goals and associated actions: (1) restore the Delta ecosystem and (2) create a reliable water supply for California. The plan recommends improving the existing channel through the Delta, developing a second conveyance channel, increasing storage capacity, and expanding local supplies to reduce dependence on imports. The Bay-Delta Conservation Plan, under development by a collaboration of State, federal, and local water agencies, will further address the recovery of endangered and sensitive fisheries in the Delta.

Colorado River System

Another key imported water supply source for the region is the Colorado River. California water agencies have a legal entitlement of 4.4 million acre-feet annually of Colorado River water. Of this amount, 3.85 million acre-feet are assigned in aggregate to agricultural users; Metropolitan's annual entitlement is

550,000. Metropolitan is the fourth priority for Colorado River supplies. In supply shortage conditions, the first three priorities would receive their full entitlements; Metropolitan's supplies could be reduced. Until a few years ago, Metropolitan routinely had access to 1.2 million acre-feet annually because Arizona and Nevada had not been using their full entitlement and the Colorado River flow was often adequate to yield surplus water. Metropolitan delivers the available water via the 242-mile CRA and the regional conveyance system.

The Metropolitan Water District of Southern California (Metropolitan) diverts Colorado River supplies based on the agreements in the 1931 California Seven-Party Agreement and the Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement of 2003 (QSA), which further quantifies priorities established in the 1931 document (see Imported Water Supplies, page SC-26 of this report). Metropolitan's diversions, within its legal entitlements, are less now than they were in the early 2000s. Surplus supplies which existed on the river then, have been reduced as other states increased their diversions in accord with their authorized entitlements. Since 2003, Metropolitan's annual deliveries have varied from a low of 633,000 acre-feet in 2006 to a high of 897,000 acre-feet in 2005. The QSA also identifies measures to conserve and transfer water through the lining of existing earthen canals. The San Diego County Water Authority has further developed conservation and transfer agreements with Imperial Irrigation District to augment its Colorado River Aqueduct supply. With full implementation of the programs identified in the QSA, Metropolitan plans to divert 852,000 acre-feet per year of Colorado River water annually plus any unused agricultural water that may be available. Additional conjunctive use agreements that Metropolitan have in operation to manage its Colorado River Aqueduct supply include the Hayfield, Chuckwalla, and Lower Coachella Valley groundwater storage programs.

Owens Valley/Mono Basin

High-quality water from the Mono Basin and Owens Valley is delivered through the Los Angeles Aqueduct (LAA) to the City of Los Angeles. Construction of the original 233 mile aqueduct from the Owens Valley was completed in 1913, with a second aqueduct completed in 1970 to increase capacity. Approximately 480,000 acre-feet per year of water can be delivered to the City of Los Angeles each year; however the amount the aqueducts deliver varies from year to year because of fluctuating precipitation in the Sierra Nevada Mountains and mandatory instream flow requirements.

Diversion of water from Mono Lake has been reduced following State Water Board Decision 1631, LADWP is also utilizing aqueduct water supplies for projects in the Inyo-Los Angeles Long Term Water Agreement (and related MOU) and the Great Basin Air Pollution Control District/City of Los Angeles MOU (to reduce particulate matter air pollution from the Owens Lake bed).

Other Water Transfers

Prior to 1991, water transfers within the South Coast region had been limited to transfers of annual groundwater basin rights (which continue to occur). Recently, municipal population growth and the need for water supply reliability have resulted in the growth of water transfer agreements. Metropolitan participates in multiple water exchange and storage programs, including agreements with Semitropic Water Storage District (WSD), Arvin-Edison WSD, San Bernardino Valley MWD, Kern-Delta Water District, Mojave Water District, and the Governor's Water Bank. The Castaic Lake Water Agency, to augment its imported water supplies, entered into agreements with several water agencies in the San Joaquin Valley. The agreements with the Buena Vista Water Storage District and Rosedale-Rio Bravo Water Storage District are long-termed, adding 11 TAF annually. It also has a limited term agreement with the Semitropic Water Storage District for 15 TAF through the year 2020.

In 1998, SDCWA entered into a transfer agreement with Imperial Irrigation District (IID) to purchase conserved agricultural water. The agreement is an important element of the QSA. In 2011, SDCWA received 75,000 acre-feet. The quantity will increase in 10,000 acre-feet increments annually up to 200,000 acre-feet per year in 2021 and then remain fixed for the duration of the 75-year agreement. Metropolitan conveys the transfer water to SDCWA via an exchange agreement.

The Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement of 2003 resulted in the concrete lining of the Coachella Canal and All-American Canal. The water supply savings from both projects are being transported to the San Diego County Water Authority, 77 TAF annually, and to several bands of Mission Indians in northern San Diego County.

Recycled Water

Although it meets only a small fraction of the overall demands in the South Coast region, recycled water supplies are being utilized in the region's four planning areas. Key factors in the continued increases in use include the upgrades of existing and construction of new wastewater treatment facilities with the latest technology to treat and produce these supplies and the continued expansion of the local infrastructures to store and convey the supplies to potential users, primarily for landscape irrigation as described in General Waste Discharge Requirements for Landscape Irrigation Uses of Municipal Recycled Water.

Additionally, the Regional Board adopted Non-Irrigation General Water Reuse (Order No. R4-2009-0049) General Waste Discharge and Water Recycling Requirements for Title 22 Recycled Water for Non-Irrigation Uses over the Groundwater Basins Underlying the Coastal Watersheds of Los Angeles and Ventura Counties. The purpose of this General WDR is to serve as a region-wide general permit for non-irrigation uses of recycled water, such as industrial cooling or dust control during construction.

Desalination

Seawater desalination projects are moving forward in the South Coast region. Two facilities will be constructed by a private company, Poseidon Resources. Recently, the San Diego County Water Authority board of directors approved an agreement with the company to purchase water supplies from the, yet to be built, facility in the City of Carlsbad. This facility will be able to produce up to 50 MGD of supplies. The same company is also working with the City of Huntington Beach to build a similar-sized facility there. The City of Long Beach, in coordination with the United States Bureau of Reclamation, City of Los Angeles Department of Water and Power, and DWR, currently operates a seawater desalination research and development facility. Other facilities are being proposed for Dana Point in Orange County and by the West Basin Municipal Water District in Los Angeles County.

Water Uses

Applied water demands are reflective of the South Coast Hydrologic Region being the most populous and urbanized area in the State. Urban water users require more 80 percent of the total water use in the region. For the period of 2006 through 2009, urban demands ranged from a high of 4,307 TAF in 2006 to a low of 3,631 TAF in 2009. The almost 16 percent reduction in urban demands reflected the hard work undertaken by the local water agencies and their respective customers to decrease demands in response to unusually dry hydrologic conditions which impacted the State in 2008 and 2009. Table SC-4 shows the downward trend in urban water uses in the South Coast region, by planning area. The exception was the

Santa Clara area which showed water demands about even with those in 2006.

PLACEHOLDER Table SC-4 Annual per Capita Water Use by Planning Area South Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Almost 75 percent of the urban water demands occurred in the Metropolitan Los Angeles and Santa Ana Planning Areas; with a little over 40 percent occurring in Metropolitan Los Angeles.

Agriculture demands increased slightly and environmental water demands were relatively stable during the period. For agriculture, total applied water demands were 663 TAF in 2006 which increase slightly to 701 TAF in 2009.

With concerns about costs and supply reliability, farmers and irrigation managers in the South Coast region are utilizing the most appropriate hardware and integrating the necessary practices in order to irrigate their crops as efficiency as possible. Vegetables and other row crops on the Oxnard Plain in Ventura County, in the coastal valleys of San Diego County, and in western Riverside and San Bernardino counties are now being irrigated with a combination of hand-move sprinklers and buried pressurized drip irrigation systems. Most all nursery operations use either drip systems, mini-jet sprinklers, or a combination of both in their irrigation operations. Lastly, citrus and avocado orchards from Ventura County to San Diego County are irrigated with well-maintained mini-jet and other sprinklers.

Drinking Water

The region has an estimated 439 community drinking water systems. In contrast to other regions of the state where the majority of the community drinking water systems are small water systems, over half of the of the community drinking water systems in the region are medium or large water systems (serving more than 3,300 people). These water systems deliver drinking water to over 95% of the region’s population (see Table SC-5). In addition, there are 19 water systems that primarily provide wholesale drinking water to retail water purveyors.

There is an estimated 182 small water systems in the region with most small water systems serving less than 500 people (see Table SC-5). Small water systems face unique financial and operational challenges in providing safe drinking water. Given their small customer base, many small water systems cannot develop or access the technical, managerial and financial resources needed to comply with new and existing regulations. These water systems may be geographically isolated, and their staff often lacks the time or expertise to make needed infrastructure repairs; install or operate treatment; or develop comprehensive source water protection plans, financial plans or asset management plans (USEPA 2012).

PLACEHOLDER Table SC-5 Breakdown of Water System Size

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

PLACEHOLDER Table SC-6 Summary of Contaminants affecting Community Drinking Water Systems in the South Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

PLACEHOLDER Table SC-7 Summary of Community Drinking Water Systems in the South Coasty Hydrologic Region Relying One or More Contaminated Groundwater Well that Exceeds a Primary Drinking Water Standard

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Water Conservation Act of 2009 (SB x7-7) Implementation and Issues

Urban Water Use Efficiency

Water conservation is a fundamental component of the South Coast region's water management planning. Water agencies in the South Coast have been aggressively implementing water conservation since the 1990s. Many local water agencies are signatories to the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding (MOU) for urban water conservation and also have adopted Urban Water Management Plans to ensure water supply reliability during normal, dry, and multiple dry years. These agencies implement the best management practices (BMPs) and demand management measures contained in those documents. The backbone of Metropolitan's conservation program is the Conservation Credits Program (CCP), initiated in 1988, that contributes $195 per acre-foot of water conserved to assist member agencies in pursuing urban BMPs and other demand management opportunities. All of the region's water suppliers have water conservation programs for their customers which feature residential and commercial water saving tips, rebates for water efficient purchases (e.g., low-flow toilets, high-efficiency clothes washers, weather-based irrigation controllers), and tools for implementing landscape/garden improvements. Local agencies are also developing water conservation master plans and conservation rate structures as well as working closely through Integrated Regional Water Management (IRWM) planning efforts to develop coordinated water efficiency programs.

The Water Conservation Act of 2009 (SBx7-7) requires each urban retail agency to establish in its Urban Water Management Plan (UWMP) a reduction goal for 2020 to help the State achieve a 20 percent statewide reduction in daily per capita water use. SBx7-7 required urban water suppliers to calculate baseline water use and set 2015 and 2020 water use targets. One hundred fifty-seven South Coast urban water suppliers have submitted 2010 urban water management plans to DWR. The urban water management plans indicate the South Coast Hydrologic Region had a population-weighted baseline average water use of 188 gallons per capita per day with an average population-weighted 2020 target of 159 gallons per capita per day. The Baseline and Target Data for individual South Coast urban water suppliers is available on the Department of Water Resources (DWR) Urban Water Use Efficiency website.

Agricultural Water Use Efficiency

With concerns about costs and supply reliability, farmers in the South Coast region are utilizing the most appropriate hardware and integrating the necessary practices in order to irrigate their crops as efficiency as possible. Vegetables and other row crops on the Oxnard Plain in Ventura County, in the coastal valleys of San Diego County, and in western Riverside and San Bernardino counties are now being irrigated with a combination of hand-move sprinklers and buried pressurized drip irrigation systems. The sprinklers are often used in the early stages of growth for the crop, with drip emitters or drip tape handling the remainder until harvest. This has been a growing trend for the past decade. This combination has been used to irrigate vegetables and nursery crops with low and high evapotranspiration requirements, such as strawberries and celeries. Most all citrus and subtropical fruit orchards grown in the region are irrigated with micro-jet sprinklers; a strategy that originated back in the 1980s. Irrigation efficiencies of 80 percent or better can be achieved.

The Water Conservation Act of 2009 (SBx7-7) requires each agricultural water supplier with over 25,000 irrigated acres to adopt and submit an Agricultural Water Management Plan to DWR. The South Coast agricultural water suppliers are smaller and tend to be under the acreage threshold. One South Coast agricultural water supplier has submitted an agricultural water management plan.

Water Balance Summary

For the period of 2006-2009, hydrologic conditions in the State and in the Colorado River watershed were major factors in the water supply requirements for the South Coast region. Water supplies required for the combined urban, agriculture, and environmental demands ranged from a low of 4,631 TAF, which occurred in 2009, to 5,158 TAF in 2006. Above average precipitation occurred throughout the State in water years 2005 and 2006 and resulted in ample deliveries of SWP supplies into the region; 1,573 TAF in 2006 and 1,645 TAF in 2007. Local imports (City of Los Angeles Aqueduct deliveries) and local reservoirs were also quite high in 2006. The City of Los Angeles Aqueduct imported slightly less than 393 TAF and contributions from local reservoirs totaled 231 TAF.

However, within a matter of a few years, these supplies were noticeably impacted by several consecutive dry years. This period began in the winter of 2007-2008 and lasted through early 2010, with the winter of 2009 and 2010 being unusually dry. Deliveries by the SWP, local imports, and local reservoirs were all impacted. Coupled with legal decisions on Delta diversions, SWP deliveries in 2009 were reduced to 810 TAF. Deliveries from the City of Los Angeles Aqueduct were 126 TAF and local reservoirs only contribute 180 TAF. Contingency plans for water supply shortages were implemented region-wide which included the utilization of emergency supplies and enactment of mandatory water use efficiency policies and programs.

Although operating under the QSA and experiencing dry conditions, imports from the Colorado River into the South Coast region increased slightly from 809 TAF in 2006 to 1,133 TAF in 2009.

The utilization of groundwater supplies remained fairly steady during the period. Peak use of groundwater occurred in 2006; 1,740 TAF and the low was 1,651 TAF the following year.

The use of recycled water supplies showed a gradual increase. In 2006, about 152 TAF was delivered to customers and that increased to slightly less than 194 TAF in 2009.

PLACEHOLDER Figure SC-5 South Coast Water Balance by Water Year, 2001-2010

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

PLACEHOLDER Table SC-8 South Coast Hydrologic Water Balance Summary, 2001-2010

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

The South Coast Hydrologic Region consists for four Planning Areas. The instream environmental use (instream and wild and scenic requirements) for the region is limited to the Santa Clara Planning Area (PA 401). There is an instream requirement in San Diego PA (PA 404), but it rarely has measurable flow. Managed wetland environmental use occurs in three PAs. See Table SC-8.

PA 401 urban applied water averaged about 250 TAF per year for water years 2006-2010, which was down a bit from previous years. Agricultural water use varied depending on rainfall, from about 240 to 350 TAF per year. Instream use was fairly constant at about 4 TAF per year, while the wild and scenic flows varied from about 10 to about 400 TAF. Most of this flow was reused downstream.

Primary supply for PA 401 was a near equal mix of groundwater, State Water Project water and local supplies (including reuse of instream environmental applied water). There is also about 4 TAF per year of recycled wastewater being applied.

The Metropolitan Los Angeles Planning Area (PA 402) is the most urbanized planning area, with urban use steadily decreasing from 1.9 MAF in water year 2006 to 1.5 MAF in WY 2010. More water is used in PA 402 for managed wetlands (27 TAF/year) than for agriculture (about 5-6 TAF per year).

Water supplies are from varied sources, including the Colorado River, Owens River (local imports) and State Water Project. In addition, about 600 TAF of groundwater are extracted and 50-90 TAF of wastewater are recycled each year.

The Santa Ana Planning Area (PA 403) is also a highly urbanized area, with 1.2-1.5 MAF of water applied to urban uses. About 130-180 TAF/ year are applied to agricultural uses and about 5 TAF for managed wetlands. Supplies are primarily groundwater with about 500-750 TAF being extracted each year. The remainder of the supply comes from the Colorado River, State Water Project, local sources and reuse. Wastewater is recycled at the rate of 55-110 TAF per year.

The San Diego Planning Area (PA 404) also has substantial urban water use, at about 630-950 TAF per year. Agricultural applied water ranges from 240 to over 300 TAF annually. Managed wetlands use is about 1 TAF per year.

PA 404 depends upon Colorado River and State Water Project deliveries to supply most of these uses. There are also about 50-100 TAF in local supplies, 60 TAF of groundwater and 40-50 TAF in reclaimed wastewater available.

Project Operations

The South Coast region maintains one of the most far-reaching systems of water management in the world. This includes facilities to convey imported water to the region; capture, store, and treat water supplies within the region; and deliver water throughout the region. The following paragraphs describe major water supply infrastructure that deliver imported water to the South Coast region. Protection of this infrastructure from earthquakes and other major catastrophes is an essential component of water management.

The California Aqueduct is 444 miles long, owned and operated by DWR, and carries SWP supplies to water agencies throughout California. The aqueduct begins at the Sacramento-San Joaquin Rivers Delta and flows by gravity south through the Central Valley to the Edmonston Pumping Plant, where it is pumped 1,926 feet over the Tehachapi Mountains. Once it has crossed the Tehachapis, the aqueduct divides into two branches—the West and the East. The East Branch feeds Lake Palmdale, Lake Perris, and the San Gorgonio Pass area, and the West Branch heads toward Pyramid Lake and Castaic Lake in the Angeles National Forest to supply the western Los Angeles basin. The SWP consists of pumping and power plants (6.5 billion KWh generated annually); 21 reservoirs (5.8 million acre-feet capacity); storage tanks; and canals, tunnels, and pipelines (DWR 2008b).

The CRA is 242 miles long, owned and operated by Metropolitan, and conveys Colorado River water to Southern California. The CRA diverts water from the Colorado River at Lake Havasu on the California-Arizona border and conveys it west across the Mojave and Colorado deserts to Lake Mathews in western Riverside County. The CRA was constructed between 1933 and 1941 to ensure a steady supply of drinking water to Los Angeles. The aqueduct consists of 2 reservoirs, 5 pumping plants, 63 miles of canals, 92 miles of tunnels, and 84 miles of buried conduit and siphons.

The Los Angeles Aqueducts comprise two aqueducts. The first LAA (or the Owens Valley aqueduct) was completed in 1913 and the second LAA was completed in1970. The first LAA was designed to deliver water from the Owens River near Independence to the City of Los Angeles. The second LAA, which added transport capacity in order to exhaust the city's water rights from the Mono Basin, starts at the Haiwee Reservoir just south of Owens Lake. Running roughly parallel to the first aqueduct, it carries water 137 miles to the City of Los Angeles.

The San Diego Aqueducts, with two branch lines, make up the backbone of the SDCWA system. The five pipelines in the two aqueducts have a combined capacity of 826 cubic feet per second (cfs). The first aqueduct (Pipelines 1 and 2) extends 70 miles from the CRA near San Jacinto to San Vicente Reservoir. Constructed by the Navy Department and US Bureau of Reclamation (USBR) from 1945 to 1954, the two pipelines share common tunnels and inverted siphons. The 94-mile second aqueduct (Pipelines 4 and 5) were constructed by SDCWA from 1957 to 1979 and are operated separately. Pipeline 3 extends from the CRA to Lower Otay Reservoir, and Pipeline 4 terminates at San Diego's Alvarado Treatment Plant near Lake Murray. Pipeline 5 ends at Lake Murray. Metropolitan owns and operates the northern portions of the pipelines; the delivery point to SDCWA is located six miles south of the San Diego-Riverside county line (USBR 2008a).

Water Quality

Surface Water Quality

Surface water quality data for the Upper Santa Clara River in the County is based on the DWR investigation of water quality and beneficial uses conducted for the Upper Santa Clara River Hydrologic Area (DWR 1993). The investigation found that Castaic Lake and Castaic Lagoon water are influenced by thermal stratification and biochemical processes. Castaic Lake contains levels of chloride that can at times vary significantly depending on hydrologic conditions and due to regulatory decisions involving the Sacramento San Joaquin Delta. The Los Angeles Regional Water Quality Control Board has set a chloride

TMDL of 100 mg/L. Within the Lake, levels of chloride can fluctuate above and below this value. The Santa Clarita Valley Sanitation District is currently tasked with reducing the chloride levels within the River. The water use agencies within the region are working with the Sanitation District to evaluate options to come up with the lowest cost alternative to meet the compliance levels.

The Los Angeles Region is the State's most densely populated and industrialized region. Despite that, many of the watersheds in this Region range over large areas that are highly diverse. A Designated Wilderness Area may occur in one part of a watershed while extensive development dominates another part and possibly agriculture exists in yet a different area of the watershed. To add to the complexity, over 1,000 discharges of wastewater from point sources are regulated by the Los Angeles Regional Board. And, surface and ground waters within the Los Angeles Region are insufficient to support the population in the Region. Consequently, water imported from other areas meets about 50% of fresh water demands in the Region. Restrictions on imported water as well as drought conditions have necessitated water conservation measures at times. In addition, the demand for water is being partially fulfilled by the increasing use of recycled water for non-potable purposes such as greenbelt irrigation and industrial processing and servicing.

Approximately 15% of the 823 Clean Water Act Section 303(d) surface water quality impairments (2010) in the Region are related to excessive nutrients; the majority of these impairments occur in lakes/reservoirs and in streams. In more urban watersheds, metals are generally the more prevalent pollutants of concern while in watersheds with more agricultural/residential activities, salts, nutrients, and, at times, pesticides are more prevalent.

In the Santa Ana planning area, water in less developed and non-agricultural areas of the watershed is typically the highest quality water in the watershed. Agricultural, industrial, commercial, and residential developments over the last approximately 150 years have degraded surface water quality. Pollutants include nutrients, sediment, pesticides and microbial contaminants such as bacteria. Concentrations of soluble mineral substances commonly referred to as ‘salinity’ or ‘TDS’, also impact surface water quality. In developed areas and agricultural areas, stormwater carries pollutants from roads, parking lots, and other sources, degrading the quality of water as it flows downstream

The approaches available to manage surface water quality include managing urban runoff through municipal NPDES permits, developing Drainage Area Management Plans (DAMP) and water quality management plans for new development and redevelopment, and encouraging low impact development. Protection of surface waters also can be achieved through construction of wetlands, implementing BMPs, using brine lines, and building and operating appropriate wastewater treatment facilities.

Regulatory measures are also in place to assure surface water quality impairment is not impairing downstream beneficial uses. Water bodies that do not meet water quality standards are identified as impaired by the Regional Water Quality Control Board and the State Water Resources Control Board and are placed on the 303(d) List of Water Quality Limited Segments. A water body remains on the list until a TMDL is adopted and the water quality standards are attained or there are sufficient data to demonstrate that water quality standards have been met and delisting should take place. Multiple TMDLs for bacteria, nutrients, sediments, pesticides, selenium, and salt are in place across the watershed and are being addressed through multi-agency task forces, many of which are administered by the Santa Ana Watershed Project Authority.

The potential impact of trace levels of constituents of emerging concern in surface water supplies is also an increasing concern for the water and wastewater agencies, regulators, and the public. These constituents, also referred to as 'emerging constituents', include a wide range of chemical constituents including pharmaceuticals, personal care products, pesticides, and other synthetic organic compounds. Potential constituents may include thousands of chemicals in consumer and health-related products such as drugs, food supplements, fragrances, sunscreen agents, deodorants, and insect repellants. Typically, these constituents of emerging concern are found at low concentrations (i.e., parts per trillion) in water bodies. Some of these chemicals enter surface water through the discharge of treated effluent when the public disposes of unused pharmaceuticals through the sewer system or the pharmaceuticals that are consumed are not entirely broken down in the human body.

Constituents of emerging concern currently are not regulated by federal or state agencies and very few have regulatory levels or California Notification Levels. In general, when detected, the chemicals occur at low concentrations in surface water. Although ecological impacts to fish and other wildlife have been shown for some of these trace contaminants in water bodies, much less is known about potential human health effects. However, some of these constituents are known or suspected to have endocrine disrupting effects if present at a sufficiently high concentration.

As part of the issuance of a tentative Waste Discharge Requirement General Order in 2006, the Regional Board requested that a program be developed to study and evaluate the potential water quality impacts of emerging constituents in imported water and wastewater discharges. Under the administration of SAWPA, a multi-agency task force of local water, wastewater and imported water agencies was formed to evaluate an appropriate list of emerging constituents to voluntarily monitor. The Emerging Constituents Sampling and Investigation Program is now conducted on an annual based and is submitted to the Regional Board each year by the Emerging Constituents Program Task Force. This program is revised and updated annually as research and regulatory monitoring requirements arise. The EC Task Force also integrates findings and recommendations from the California Department of Public Health and the State Board's Water Recycling Policy expert panel on emerging constituents EC monitoring as they arise.

Groundwater Quality

Santa Clara and Metropolitan Los Angeles

The groundwater basin has two sources of groundwater, the Alluvial Aquifer whose quality is primarily influenced by rainfall and stream flow, and the Saugus Formation which is a much deeper aquifer and recharged primarily by a combination of rainfall and deep percolation from the partially overlying Alluvium. The larger part of the Valley's groundwater supply is from the Alluvial Aquifer, between 30,000 to 40,000 AFY; and a smaller portion of the Valley's water supply is drawn from the Saugus Formation, between 7,500 and 15,000 AFY in normal water years.

Local groundwater does not have microbial water quality problems. Parasites, bacteria and viruses are filtered out as the water percolates through the soil, sand and rock on its way to the aquifer. Even so, disinfectants are added to local groundwater when it is pumped by wells to protect public health. Local groundwater has very little TOC and generally has very low concentrations of bromide, minimizing potential for DPB formation. Taste and odor problems from algae are not an issue with groundwater.

The mineral content of local groundwater is very different from SWP water. The groundwater is very "hard," and it has high concentrations of calcium and magnesium (approximately 250 to 600 mg/L total hardness as $CaCO_3$). Groundwater may also contain higher concentrations of nitrates and chlorides when compared to SWP water. However, all groundwater meets drinking water standards.

Perchlorate is a regulated chemical in drinking water. In October 2007, DPH established an MCL for perchlorate of 6 ug/l. Perchlorate has been a water quality concern in the Valley since1997 when it was originally detected in four wells operated by the Purveyors in the eastern part of the Saugus Formation, near the former Whittaker-Bermite facility. As a result of the contamination, six wells were ultimately taken out of service upon the detection of perchlorate including four Saugus wells and two alluvial wells. All have either been (1) abandoned and replaced, (2) returned to service with the addition of treatment facilities that allow the wells to be used for municipal water supply as part of the overall water supply systems permitted by the State Department of Public Health (DPH) or (3) will be replaced under an existing perchlorate litigation settlement agreement (See Section 5 of the Castaic Lake Water Agency's 2010 UWMP for more details on this issue).

The general quality of ground water in the Region has degraded substantially from background levels. Much of the degradation reflects land uses. For example, fertilizers and pesticides, typically used on agricultural lands, can degrade ground water when irrigation-return waters containing such substances seep into the subsurface. In areas that are unsewered, nitrogen and pathogenic bacteria from overloaded or improperly sited septic tanks can seep into ground water and result in health risks to those who rely on ground water for domestic supply.

In areas with industrial or commercial activities, aboveground and underground storage tanks contain hazardous substances. Thousands of these tanks in the Region have leaked or are leaking, discharging petroleum fuels, solvents, and other substances into the subsurface. These leaks as well as other discharges to the subsurface that result from inadequate handling, storage, and disposal practices, can seep into the subsurface and pollute ground water. Compared to surface water pollution, investigations and remediation of polluted ground waters are often difficult, costly, and extremely slow.

Examples of specific groundwater quality problems include:

- San Gabriel Valley and San Fernando Valley Groundwater Basins: Volatile organic compounds from industry, and nitrates from subsurface sewage disposal and past agricultural activities, are the primary pollutants in much of the ground water throughout these basins. These deep alluvial basins do not have continuous effective confining layers above ground water and as a result pollutants have seeped through the upper sediments into the ground water. Approximately 20% of groundwater production capacity for municipal use in the San Gabriel Valley has been shut down due to this pollution.
- In light of the widespread pollution in both the San Gabriel Valley and San Fernando Valley Groundwater Basins, the California Department of Toxic Substances Control has designated large areas of these basins as high priority Hazardous Substances Cleanup sites. Furthermore, the USEPA has designated these areas as Superfund sites. The Regional Board and USEPA are overseeing investigations to further define the extent of pollution, identify the responsible parties, and begin remediation in these areas.

The Los Angeles Department of Water and Power has developed programs to accelerate treatment for the San Fernando Valley groundwater which includes a comprehensive Groundwater System Improvement

Study, installing monitoring wells, interim wellhead treatment, and working with regulatory agencies and government officials to identify those responsible for the contamination.

The City of Glendale has been the lead agency for research to determine the effectiveness of processes to remove the contaminant, Chromium IV, from local groundwater supplies. The current State level for the contaminant in drinking water is 5 parts per billion. The final phase of the research is determine the feasibility of decreasing the level of the contaminant below 1 part per billion.

- Central and West Coast Groundwater Basins (Los Angeles Coastal Plain): Seawater intrusion that has occurred in these basins is now under control in most areas through an artificial recharge system consisting of spreading basins and injection wells that form fresh water barriers along the coast. Ground water in the lower aquifers of these basins is generally of good quality, but large plumes of saline water have been trapped behind the barrier of injection wells in the West Coast Basin, degrading significant volumes of ground water with high concentrations of chloride. Furthermore, the quality of ground water in parts of the upper aquifers of both basins is degraded by both organic and inorganic pollutants from a variety of sources, such as leaking tanks, leaking sewer lines, and illegal discharges. As the aquifers and confining layers in these alluvial basins are typically interfingered, the quality of ground water in the deeper production aquifers is threatened by migration of pollutants from the upper aquifers.
- Ventura Central Groundwater Basins: Despite efforts to artificially recharge ground water and to control levels of pumping, ground water in several of the Ventura Central basins has been, and continues to be, overdrafted (particularly in the Oxnard Plain and Pleasant Valley areas). Some of the aquifers in these basins are in hydraulic continuity with seawater; thus seawater is intruding further inland, degrading large volumes of ground water with high concentrations of chloride. In addition, nutrients and other dissolved constituents in irrigation return-flows are seeping into shallow aquifers and degrading ground water in these basins. Furthermore, degradation and cross-contamination are occurring as degraded or contaminated ground water travels between aquifers through abandoned and improperly sealed wells and corroded active wells.

Unsewered areas of Ventura County, such as the El Rio area (to the northwest of Oxnard), represent another source of pollution to ground water in the Ventura Central Basins. In many wells in the El Rio area, nitrate is present in levels exceeding maximum contaminant levels (MCLs) established by the state and federal government.

Santa Ana Planning Area

Among the groundwater quality challenges facing the Santa Ana watershed basins, high salt and nitrate concentrations are the most pervasive. Sources of elevated levels include mineral content in the sediments, recharge and drainage patterns, source water quality, irrigation, wastewater discharges, and historic land use. Managing levels of TDS in groundwater basins is a significant challenge as the recycling of waste water increases in the Watershed. Each cycle of residential water use typically adds approximately 200 mg/L of salt to the water. Industrial and commercial operations may contribute higher levels. Construction and use of salinity management facilities, such as brine lines and desalters, are being used to prevent salt-build up and to remediate high TDS groundwater basins. Elevated levels of nitrates in groundwater originate primarily from use of fertilizers, confined animal feedlots, and waste water treatment facilities.

There are five management zones in the Santa Ana River watershed area. They are the Upper Santa Ana River Basin, Chino Basin, Middle Santa Ana River Basin, San Jacinto River Basin, and the Lower Santa Ana River Basin. In addition to salts and nitrates, some basins areas are also challenged by VOC contamination, perchlorate, TCE, PCE, DBCP, arsenic, hexavalent chromium. Here is summary of the issues and actions being implemented to address those issues by the local agencies.

Upper Santa Ana River Basin

The Upper Santa Ana River Basin is divided into seven smaller zones. In the Bunker Hill management zones, the largest area of groundwater contamination is the Newmark Superfund Site. Treatment plants are operating to remove VOC contamination. A total of thirteen extraction wells produce on average approximately 26,000 AFY, which is treated at the four treatment plants.

In the Bunker Hill B management zone, a six-mile long plume of VOC and ammonium perchlorate contamination, known as the Crafton-Redlands Plume, was first detected in the early 1980's. Approximately 46 drinking water wells have been affected. A number of well head treatment units and treatment plants to remove these contaminants are being operated by the Cities of Redlands, Loma Linda and Riverside.

Cherry Valley is an unincorporated area located northeast of the City of Beaumont, in the Beaumont management zone. The community is not served by a sanitary sewer system. The only source of drinking water for the community is the groundwater. A study commissioned by the San Timoteo Watershed Management Authority indicated an ongoing degradation of the quality of the groundwater due to nitrate. The source of the nitrate was attributed to the onsite waste treatment systems, i.e., septic systems.

The County of Riverside has adopted three ordinances to ban new septic systems unless the systems are designed to remove 50 percent of the nitrogen in the discharged wastewater. Beaumont Cherry Valley Water District is in the process of providing sewer service to a major portion of the area and has applied for State Revolving Fund loans for the project.

Chino Basin, Cucamonga, and Rialto Management Zones

The Chino Basin is experiencing rapid commercial and residential development. The groundwater quality in the basin is generally good, with better groundwater quality found in the northern portion where recharge occurs. Salinity (TDS) and nitrate concentrations increase in the southern portion of the Basin. Between 2001 and 2006, about 80 percent of the private wells south of Highway 60 had nitrate concentrations greater than the MCL. Pollution from point sources and emerging contaminants are concerns for the overall groundwater quality in Chino Basin. Constituents that have the potential to impact groundwater quality include VOCs, arsenic, and perchlorate.

In the Rialto management zone, at least 20 wells providing 40,135 gallons per minute (gpm) of domestic water supply capacity to the Cities of Rialto and Colton, West Valley Water District and Fontana Water Company have been contaminated by perchlorate. Well head treatment is operating on 11 of these wells. Arsenic at levels above the MCL appears to be limited to the deeper aquifer zone near the City of Chino Hills. Total chromium and hexavalent chromium, while currently not a groundwater issue for Chino Basin, may become so, depending on the promulgation of future standards.

Middle Santa Ana River Basin.

Several active sites in the City of Riverside's groundwater production system have increased monitoring schedules due to the presence of contaminants including: nitrate, PCE, dibromochloropropane (DBCP), and perchlorate. As a result, the City of Riverside has implemented blending plans, increased monitoring schedules, and installed well-head treatment to address these elevated levels. Blending plans also are being used to reduce nitrate levels in wells exceeding allowable limits.

San Jacinto River Basin Agricultural activities in the San Jacinto River Basin are suspected to be partially responsible for elevated salt and nitrate concentrations in the groundwater. Septic tank discharges are creating significant water quality problems that have triggered local agency and the Regional Board's regulatory response in the unincorporated areas of Quail Valley (north of Canyon Lake) and Enchanted Heights (west Perris). The basin is dotted with several other areas believed to be at risk of water quality degradation from septic systems. A septic system management plan has been developed by Riverside County Flood Control.

A Groundwater Salinity Management Program, developed by EMWD, addresses several water quality issues in this area. The Perris South Subbasin contains a surplus of marginal to unusable quality groundwater that flows into the adjacent high quality Lakeview Subbasin, rendering several wells unusable and threatening the remaining production of the basin. Due to the unavailability of imported water, blending to improve water quality is not an option. Therefore, three desalination facilities, two constructed and one being designed, will recover high TDS water in the Menifee and Perris South Groundwater Management Zones for potable use. In addition to providing clean drinking water, the desalters will play a role in reducing the migration of brackish groundwater into areas of good quality groundwater. Several active wells are operating with increased monitoring schedules due to the confirmed presence of various contaminants including nitrate, TCE, PCE, TDS, and other VOCs. Treatment is not required, and monitoring indicates no increase in contaminant levels over time.

Lower Santa Ana River Basin

The Lower Santa Ana River Basin contains four groundwater management zones: Orange County, Irvine, La Habra, and Santiago. The La Habra and Santiago Management Zones have minimal pumping and TDS and nitrate WQOs have not been established due to the scarcity of data. This section focuses on the Orange County and Irvine Management Zones, which are important sources of water in Orange County.

The Orange County Groundwater Basin is the source of approximately 60 to 70 percent of the water supply for 2.3 million people. Of this total production, about 90 percent meets drinking water standards without treatment. The remaining 10 percent requires treatment for VOCs, salts, or other constituents.

A shallow VOC plume exists in the Anaheim/Fullerton area where VOC concentrations exceed MCLs over approximately six square miles. To address this plume, the North Basin Groundwater Protection Project is being designed to extract and treat VOC-contaminated groundwater and recharge treated water back into the groundwater basin. Other VOC plumes exist in Orange, Santa Ana, the Seal Beach Naval Weapons Station, and the now closed Tustin Marine Corps Air Station. Various other sites have generally shallow VOC contamination or other contaminants. The Tustin desalters, using reverse osmosis and ion exchange, treat high TDS, nitrate, and perchlorate levels in a section of Tustin. Areas in Garden Grove have groundwater with high nitrate concentrations that are likely the result of historic agricultural practices.

The Irvine Management Zone is a sub-basin of the Orange County Groundwater Basin. Water naturally flows between the boundaries but the operation of the Irvine Desalter limits movement of water between the two management zones.

Groundwater contaminated with VOCs exceeding MCLs from the now closed El Toro Marine Corps Air Station also contains high TDS and nitrate concentrations. The Irvine Desalter, using reverse osmosis, air stripping, and carbon absorption, was built to treat the contaminated water. Water treated for VOC contamination is distributed after treatment through the Irvine Ranch Water District non-portable system (irrigation and other non-potable uses); water treated for high TDS and nitrate is distributed through the potable system.

To address and monitor groundwater quality challenges, SAWPA has implemented a task force approach involving multiple agencies who collaboratively agree to prepare water quality monitoring reports and analysis to assure beneficial uses in groundwater are protected.

Groundwater Conditions and Issues

This section is under development.

Near Coastal Issues

Coastal waters are impacted by a variety of activities which include:

- Municipal and industrial wastewater discharges
- Cooling water discharges
- Leaking septic systems
- Oil spills from tankers and offshore platforms
- Vessel wastes
- Dredging
- Increased development and loss of habitat
- Illegal dumping
- Natural oil seeps

Approximately 15% of the 823 Clean Water Act Section 303(d) surface water quality impairments (2010) in the Region are for pathogen-related pollutants, the majority at locations along the open coast such as beaches. Other coastal waters, such as harbors and marinas, are listed as impaired for a variety of legacy pesticides (DDT, in particular), metals, and other organics (polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs)). Pollutants often accumulate in the sediments of harbors and marinas. This complicates the task of conducting maintenance dredging due to disposal issues and can also impact marine life. Many harbors and marinas are located at sites of former large wetland complexes and at the mouths of rivers; the harbors and marinas are utilized by a diverse array of marine life despite the extensive anthropogenic changes to the areas. Prevention of additional pollution and cleanup of in-place pollutants can contribute greatly to improving local fisheries and the near-shore coastal ecosystem.

As seawater or ocean desalination technology advances in the South Coast region, the coastal environments near the facilities must be monitored for possible impacts. Testing is underway for the facility owned by the City of Long Beach on feasibility of using intake structures on the seafloor as a way to avoid coastal environmental concerns.

Flood Management

Risk Characterization

Floods in the South Coast region are generally dangerous because of the interaction of weather events and the built landscape. Flooding in 1969 took the lives of 103 people and caused more than $160 million in damages to the South Coast Hydrologic Region. Due to increased development, the 1969 flood was the worst on record for the counties of Ventura, Orange, San Bernardino, and Riverside. In 1978 intense storms combined with inadequate drainage systems caused widespread street flooding and forced the evacuation of homes and businesses residing in lower elevations in Ventura, Los Angeles, Orange, San Bernardino, and Riverside counties. Damages caused by this event were estimated to be $86 million. In 1980 a powerful series of storms left the region with destroyed homes, washed out bridges and roads, and disrupted utilities. Thousands of people were evacuated from the area, and 29 people lost their lives. Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties were declared disaster areas by President Carter. A heavy downpour led to spill at the Las Llajas Dam near Simi Valley, resulting in considerable erosion on Las Llajas Creek and bridge damage in Moorpark.

Unusually heavy storms hit the region in 2005, 2006, and 2010, causing debris flows. In 2005, two powerful Pacific Ocean storms came on shore to bring heavy rainfall and snow. Many of the region's rivers had significant flow including the Santa Clara River in Ventura County, the Santa Ana River, and Mission River in San Diego. Mud and debris flows blocked roads and caused property damage. A landslide caused loss of life in the community of La Conchita in western Ventura County.

The impacts of the storms of 2005, 2006, and 2010 increased in magnitude because they occurred shortly after major brush fires. Major fires included the Old and Cedar fires in the San Bernardino Mountains and the Station fire in the San Gabriel Mountains. Erosion of the slopes, laid bare by the loss of vegetation, clogged debris basins in both mountain ranges. Emergency debris removal operations for the basins were required to create capacity in the basins.

PLACEHOLDER Table SC-9 Record Floods for Selected Streams, South Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Damage Reduction Measures

Santa Ana Planning Area

Most flood damage reduction strategies historically have consisted of hardening and straightening the stream channels to maximize drainage efficiency and buffering peak flows by providing large flood storage facilities. In general, communities in the Santa Ana River Watershed have been effective at reducing flood damage risk, allowing the traditional California urban and suburban development to be maximized. However, some highly populated areas remain vulnerable to flooding even in fairly modest storms. In addition, the current principle strategies are expensive in terms of money, natural resources impacts, and lost water supply. Changing community values are forcing a re-evaluation of the traditional approach to managing flood risk, in effect changing the terms in the "cost-benefit" equation used for the past century.

There are two additional key issues that flood management must address in order to succeed. First, the basic goals of flood control efforts throughout the watershed need to be clarified and reaffirmed.

Although there are few formalized rules, the most common planning and design guideline in the region is to design for the 100-year flood. How and why that level of protection became a community standard, and whether or not it is appropriate, is not free from doubt. There have been recent bills in the legislature proposing different standards, e.g. 200-year protection. This should be a watershed-scale community decision based on a balance of risks and economic and environmental costs. To facilitate such an agreement, we need a common vocabulary for the risks and costs associated with flooding and other competing issues, such as water supply and water quality.

Second, the reality has been that very early land use decisions have preceded flood management strategies and have severely limited the alternatives that flood managers can consider. Once development has been allowed to encroach into a floodplain, regional storage and hardened, straightened, and levied channels may be the only feasible approaches. Ideally, it would be better to devise a flood management strategy during the original planning of the development of a region, so that flood risk management and other land and water needs could be optimized. Because that has never been the practice in most regions, and because many regions are now highly urbanized, flood control agencies and other local agencies will need to collaborate to determine what, if any, new approaches would be productive going forward.

Existing Damage Reduction Structures

Los Angeles County Drainage Area

The Los Angeles County Drainage Area (LACDA) system is a flood management system that started to be developed in the 1800's and was completed by 1970. The system consists of concrete river channels, dams and reservoirs, flood retention and debris basins, and spreading grounds. It was developed in response to severe flooding that had plagued the County of Los Angeles for over a century. The Los Angeles River, in specific, was both unpredictable and uncontrollable and posed a threat to the adjacent established communities. The river was known to change course between flowing west into the Santa Monica Bay and flowing south towards the San Pedro Bay. In 1815 the Los Angeles River flood washed away the original Pueblo de Los Angeles (between downtown Los Angeles and Chinatown). In 1825 a flood caused swamps to be formed between the Pueblo location and the Pacific Ocean.

Catastrophic flood events continued through the turn of the 20th century. In 1914, one of the most devastating floods caused approximately $10 million in damages throughout the developing Los Angeles basin, which brought a public outcry for action to address the recurrent flooding problems. As a result, by the following year the Los Angeles County Flood Control District was formed to undertake initial flood control efforts, including the construction of major dams and some channelization. Due to the flooding disasters, the Los Angeles River's purpose was shifted from water supply to flood control. After two more destructive floods in the 1930's, Federal assistance was requested and the Army Corps of Engineers took a lead role in channelizing the river. The channelization effort began in 1938 and required three million barrels of concrete and 100,000 workers. By 1960, the project was completed to form a fifty-one mile concrete-lined watercourse through thirteen cities.

PLACEHOLDER Photo SC-2 Major Flooding in the 1800's & Early 1900's

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Before channelization of the river, flood control projects and utilization of the river as a source of water changed the system of streams, wetlands, and swamps of the natural lands. Channelization provided flood control for the increasingly developed region and a consistent path for the river course. Today, the banks of the river are almost fully lined along its entire length.

In February 1980, flooding caused the lower Los Angeles River to reach channel capacity; therefore, the County of Los Angeles requested the Army Corps of Engineers to review the level of flood protection provided by the LACDA system. The 1987 Army Corps' LACDA review study concluded that the lower Los Angeles River and Rio Hondo provided a 25 to 40-year level of flood protection. As a result, the Water Resources Development Act of 1990 authorized construction of the LACDA Project (Project). The Army Corps completed the LACDA Review Final Feasibility Report in June 1992, which defined the scope of the Project to restore a minimum 100-year level of protection; the Project was approved for construction in 1995.

By 1995, the areas surrounding the river consisted of urbanized development. In the event of a 100-year storm, the communities would have suffered tremendously as floodwaters would have overflowed the levees and eroded the landward side of the levees. Approximately 82 square miles of dense urban areas would have been inundated and impacted 500,000 residents and 177,000 structures in 14 communities. The impacts would have resulted in $2.3 billion in flooding damage. In 1998, due to the threat of flooding, the Federal Emergency Management Agency required 72,000 property owners to purchase flood insurance at a cost of $32 million annually, until the LACDA project was completed.

The LACDA Project area included improvements to the lower Los Angeles River, Rio Hondo, and the lower portion of Compton Creek. To increase the flood capacity to a 100-year level of protection, the Project involved raising the earthen levee embankment or building parapet walls on top of 21 miles of existing levees by approximately four feet. The Project also involved the modification of 24 vehicular, railroad, and utility bridges. The construction was originally estimated to take twelve years and cost $375 million. However, due to increases in federal funding the project was completed ahead of schedule in December 2001 and cost $220 million. As a result, the Project was designed to provide multi-purpose features, which converted the Los Angeles River from a single-use flood control facility to a multi-use facility that includes recreational trails, landscaping and aesthetics, and habitat restoration opportunities.

PLACEHOLDER Photo SC-3 Los Angeles River-Deforest Park and Bike Trail

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Santa Ana Planning Area

Prado Dam was built primarily for downstream flood protection, and 92 percent of the Santa Ana River Watershed lies above it. More recently, the dam also has become a vital component of the water supply management program in the region, and has al-lowed the creation of ecologically important habitat areas behind the dam. According to a Santa Ana mainstem report, when Prado Dam was built, it was to provide protection against flooding in a 200-year event. Because the area has become so heavily populated, that number has decreased to 70 years with downstream channel capacity reduced to approximately 50 years.

As a result, the Army Corps of Engineers (Corps) initiated the Santa Ana River Mains-tem Project (SARP) in 1964 and was completed in 2010. The Corps completed a survey report in 1975 and the Phase

I General Design Memorandum (GDM) for the SARP in 1980. Construction of the SARP was authorized by Section 401(a) of the Water Re-sources Development Act of 1986. Construction of the SARP was initiated in 1989, and completion scheduled for 2010.

The SARP is located along a 75-mile reach of the SAR in Orange, Riverside and San Bernardino Counties. The plan for flood control improvements includes three principal features:

1. Lower river channel modification for flood control along the 30.5 miles of the SAR from Prado Dam to the Pacific Ocean.
2. Construction of Seven of Seven Oaks Dam (about 3.5 miles upstream of the existing Prado Dam) with a gross reservoir storage of 145,600 acre-feet (AF).
3. Enlargement of Prado Dam to increase reservoir storage capacity from 217,000 AF to 362,000 AF.

The Seven Oaks Dam Watershed comprises 177 square miles, excluding 32 square miles that is isolated by Baldwin Lake. The principal tributary within the Seven Oaks canyon area is Bear Creek, which drains 55 square miles, and has an average gradient of 460 feet/mile. The only existing structure that would affect flood flows in this sub-watershed is Big Bear Lake, which is a water conservation reservoir. It collects water from a 38-square-mile drainage area, and has a surcharge storage capacity of about 8,600 AF between the top of the conservation pool and the top of the dam. Aside from Seven Oaks Dam, the only other major flood control dam above Prado Dam is San Antonio Dam.

Other smaller flood control improvements exist along Cucamonga, Deer, Lytle, and Cajon Creeks above Prado Dam, Carbon Canyon Dam and Villa Park Dam in Orange County. These include channelization, debris basins, storm drains, levees, stone and wire-mesh fencing, stone walls or rip-rap along the banks of stream channels, concrete side slope protection, and drop structures. There are more than 100 water conservation and recreational reservoirs in the basin, with storage volumes ranging from 5 AF to 182,000 AF in Lake Mathews. These improvements affect the regimen of lesser flood flows, but do not appreciably affect major flood flows. Lake Elsinore can have considerable influence on flood flows depending on its water surface elevation at the beginning of a storm.

By 1988, the Corps noted that the SAR was uncontrolled for much of its length in Riverside and San Bernardino Counties above Prado Dam. Flooding in 1969 had caused serious damage to sewage treatment plants, sewage lines, and bridges, and had flooded large areas of agricultural land and caused heavy bank erosion along most of the river. Below Prado Dam, the Corps calculated that downstream communities enjoyed about 70-year flood protection, while parts of the channel near Fountain Valley and Huntington Beach could not contain a 50-year flood. A 100-year flood would inundate over 160 square miles of urbanized land in Orange County.

The intent of the Santa Ana River Project (SARP) was to provide the developed and developing areas in the Watershed with approximately 100-year flood protection through the end of the project life. While this system of infrastructure has been in development, the three counties that comprise the Watershed and the various cities within them, have overseen the growth of the region’s population and its conversion, broadly speaking, from agriculture to an urban setting. The population of the three counties comprising the Watershed was less than 400,000 in 1940, and is now more than 7 million, most densely concentrated in the SAR Watershed.

In addition to the mainstem of the SAR, the regional flood control agencies each have extensive plans governing flood management for tributaries. For example, the Upper SAR Watershed is contained within San Bernardino County Flood Control District's (SBCFCD) jurisdiction. There are approximately seven major and three minor mainline flood control systems draining directly into the SAR from San Bernardino County. In addition, two systems flow directly into Prado Flood Control Basin which connects to the SAR. Of these 12 mainline systems, eight are built to their ultimate capacity. The remaining ones are in an interim condition and need upgrading. Many of the regional subsystems that feed these main lines are in interim condition; a few others are merely proposed facilities.

Though most concrete structures typically are designed to have a 50 year lifespan, SBCFCD has a number of facilities that are older than 50 years and still function well. Many of the SBCFCD's facilities were built by the Corps in the 30s, 40s, 50s, 60s and 70s. Most of those facilities still are considered to be stable and secure structures with little or no repair requirements.

From SBCFCD's perspective, the majority of the mainline system is built out to ultimate, but the interim facilities operating within our jurisdiction are in need of improvements. The regional interim subsystems consist of rail and wire revetment or simple rock slope protection. These facilities experience erosion and undercutting on a regular basis. Also, these interim systems do not provide the ultimate capacities and as communities develop, increasing runoff volumes further compromise those capacities. In conclusion, although the mainline systems are complete, the regional subsystems are acceptable at best, and the flood control system as a whole is in need of improvements.

Water Governance

Although there is a heavy reliance on groundwater supplies for most of the South Coast Hydrologic Region, there are several groundwater basins that have been adjudicated. For the Santa Clara Planning Area, there is the Santa Paula Basin. For the Metropolitan Los Angeles Planning Areas, the adjudicated basins are the Central and West Coast Basins, Main San Gabriel Basin, Puente Basin, Raymond, and the Upper Los Angeles River Basin. In the Santa Ana area, they are Bunker Hill, Chino, Cucamonga, Rialto-Colton Basin and the Six Basin. In San Diego, the lone basin is the Santa Margarita Basin.

In the Santa Clara area, State legislation established the Fox Canyon Groundwater Management Agency. This agency is initiating actions to mitigate problems for some of the sub-basins of the Upper Santa Clara River Valley basin.

In the Santa Ana area, litigation of surface water use and rights relating to groundwater use has a long history within the Santa Ana River system. During the mid-1960s, Orange County Water District filed a lawsuit involving several thousand defendants in the upper watershed Riverside and San Bernardino Counties and hundreds of cross-defendants in Orange County for surface water rights to support management of the Orange County groundwater basin. On April 17, 1969, a stipulated judgment (Prado Settlement) was entered in the case which provided that water users in the Orange County area have rights to receive an annual average supply of 42,000 acre-feet of base flow at Prado Dam, together with the right to all storm flow reaching Prado Dam. Lower basin users may make full conservation use of Prado Dam and reservoir subject to flood control use. Water users in the upper basin, represented by the upper basin SAWPA agencies of IEUA, WMWD, EMWD and SBVMWD, have the right to pump, extract, conserve, store and use all surface and groundwater supplies within the upper area, providing lower area entitlement is met.

Management plans for both surface water and groundwater have been prepared and implemented primarily by the SAWPA member agencies including the Santa Ana IRWM. As a result of the cooperation among the litigants from the 1969 Prado Settlement, a joint powers authority known as the Santa Ana Watershed Project Authority (SAWPA) was formed first as a regional planning agency in 1968 and then in 1972 reformed as to assist regional planning and then as a planning and project implementation agency to support planning recommendation. In fact, the regional planning conducted in SAWPA's early days, went on to become the basis for the State Regional Board plans now conducted for water quality planning across the State.

State Funding Received

In 2011, CLWA, as the grantee agency for the Upper Santa Clara River IRWM Region and on behalf of the Regional Water Management Group (RWMG), applied for and was awarded a $6,931,000 Implementation Grant from the California Department of Water Resources (DWR) through its Proposition 84 IRWM grant program. The $6.9 million Implementation Grant award from Round 1 of DWR's Proposition 84 Implementation Grant Program will help fund four projects that were developed in response to the objectives of the IRWM Plan. The projects are (1) CLWA's Santa Clarita Valley Water Use Efficiency Plan programs, (2) Newhall County Water District's removal of sewer trunk line from the Santa Clara riverbed, (3) CLWA's Santa Clarita Valley South End Recycled Water Project (Phase 2C) and (4) the City of Santa Clarita/U.S. Forest Service Santa Clara River and San Francisquito Creek Arundo and Tamarisk removal project. In 2012, CLWA applied for and received notice of draft recommendation of an award of $734,000 from DWR's IRWM Planning Grant Program to update its 2002 Recycled Water Master Plan and prepare the associated environmental documentation, and to update its Water Use Efficiency Strategic Plan. There is an effort underway to identify projects appropriate for the Round 2 Implementation Grant funds currently available through DWR's IRWMP program, applications are due in March 2013.

In 2011, SAWPA received $12.7 million dollars in grant funding to support water related infrastructure and the OWOW Plan goals and objectives from California Proposition 84 Chapter 2 IRWM Implementation Round 1. In 2011, SAWPA applied for and received $1 million in grant funding from the California DWR Prop. 84 Chapter 2 IRWM Planning Grant program which will allow the OWOW Plan to be updated by late 2013.

Local Investment

Since 2008, SAWPA has invested $1.1 million in local IRWM planning in support of the OWOW plan development. This included extensive coordination, planning and out region throughout the region. In addition, agencies in the watershed are providing $234,167,320 in local funding to match the $12.7 million received from DWR Prop 84 IRWM Implementation grant program.

Current Relationships with Other Regions and States

The South Coast region is a major importer of water supplies from other regions both within and outside of the state. Because these supplies are vital to sustaining the South Coast region, local representatives work closely with other regions to ensure that their local resource needs are met while ensuring the reliability of supply to the South Coast region.

Within this region, water supply agencies have undertaken strategic regional planning to increase the reliability of local water supplies during normal and dry hydrologic conditions. This effort has resulted in the preparation and execution of water transfer and banking agreements both within and outside of the region. Outside of the South Coast region, environmental and water resource management in the Delta, Colorado River, and Owens River systems affect imported water supply reliability and quality. However, these inter-regional and inter-state linkages go well beyond direct water use. The overall planning direction (i.e., land use development patterns, economic drivers, and agricultural production) established in other regions effect water resources available to the South Coast. As a region dependent on others, the South Coast agencies recognize the need to invest in water management strategies in these other regions in order to provide coordinated benefits.

Interregional and Interstate Activities

Interstate Actions

The Metropolitan Water District of Southern California has a diversion and storage agreement with the Southern Nevada Water Agency for unused Colorado River supplies. In the agreement, Metropolitan will be able to divert and store a certain quantity of SNWA’s unused Colorado River water supplies. SNWA can request that the supplies be returned to them in later years; Metropolitan would divert less Colorado River.

In an agreement with the United States Bureau of Reclamation, Metropolitan has been able to store conserved Colorado River water supplies in Lake Mead. Some of the stored water comes from Metropolitan’s Land Management, Crop Rotation, and Water Supply Program agreement with the Palo Verde Irrigation District.

Agreement with Mexico

A five-year agreement has been reached between the United States and Mexico which exchanges 95 TAF of Mexico’s share of the Colorado River for financial assistance with the repairs of damage to water delivery infrastructure in the Mexicali Valley caused by the 2010 El Mayor-Cucapah Earthquake. Several hundred miles of irrigation canals were damaged by the seismic event; impacting about 80,000 acres of farmland in the valley. The Metropolitan Water District of Southern California (Metropolitan), the Southern Nevada Water Authority, and Central Arizona Water Conservation District will collectively provide $10 million to assist in the repairs. Metropolitan will contribute $5 million towards the costs and will receive 47.5 TAF of water supplies.

Collaborative Efforts with Areas Adjacent to the Watershed

The Santa Ana IRWM region is surrounded by six other IRWM regions, as shown in the map below, including: South Orange County Watershed Management Area, Upper Santa Margarita, Greater Los Angeles County, Gateway Region, Coachella Valley and Mojave.

Of these six regions, the largest opportunities for coordination and cooperation are Los Angeles, South Orange County, and Gateway. Coordination with Orange County is frequent, as part of Orange County is located in the watershed and there are multiple forums for coordination. As part of this planning effort, meetings were held with Greater Los Angeles and Gateway. SAWPA proactively seeks meeting with neighboring regions quarterly to share and stay abreast of critical issues, ongoing efforts, and opportunities for collaboration in the region.

The watershed area encompasses the service areas of many local agencies and organizations. There are over 120 local agencies contained within the watershed that may be considered water entities.

Sacramento-San Joaquin Delta

SWP contractors in the South Coast region—including Metropolitan, CLWA, San Bernardino Valley MWD, VCWPD, SGPWA, and San Gabriel Valley MWD—work with DWR to coordinate delivery of SWP supplies. Because of a series of short-term ecosystem collapses in 2007, including declines in native species and significant loss of habitat, Metropolitan also participates with DWR and other State, federal, and local agencies and environmental organizations in the development of the Bay-Delta Conservation Plan (BDCP). Metropolitan further maintains individual relationships with each of its 26 member agencies for sale and conveyance of SWP supplies, as well as adjacent agencies with which it has storage and transfer agreements (see discussion below).

Significant restrictions were placed on SWP pumping in accordance with the December 2007 federal court imposed interim rules to protect the Delta smelt (Hypomesus transpacificus). Additionally, the inherent annual variability in location, timing, and amount of precipitation in California introduces uncertainty to the availability of future SWP deliveries. Environmental concerns, droughts, and other important factors that impact supply reliability include the vulnerability of Delta levees to failure due to floods and earthquakes, as well as long-term management and maintenance of SWP conveyance infrastructure will impact future deliveries. As the regional SWP wholesaler, Metropolitan is continuing to develop closer relationships with DWR and other State agencies to deal with fundamental Delta issues including environmental protection and levee rehabilitation.

Colorado River

Metropolitan and USBR have been working together for many decades to manage Colorado River deliveries, including drought allocation planning and salinity management. Allocations and diversions of Colorado River water function within the legal and administrative rules known as the “Law of the River” (see Table SC-3). With full implementation of the programs identified in the QSA, Metropolitan expects to be able to annually divert 852,000 acre-feet of Colorado River water plus any unused agricultural water that may be available. With continuation of the current drought, however, the South Coast’s reliance on diversions of excess Colorado River water (such as wet-year flows and allocated but unused supplies) will place substantial pressure on regional water availability.

Metropolitan will continue to collaborate with USBR to ensure the reliability and quality of Colorado River supplies. Although agricultural water conservation and transfer agreements (described below) will increase the volume of water available to the South Coast region via the CRA, further development of local supplies will be necessary to defend against future shortages.

Owens Valley and Mono Basin

In 1991, LADWP entered into the Inyo/Los Angeles Long Term Water Agreement to ad-dress impacts from groundwater pumping in the Owens Valley. In 1994, the State Water Board ruled on decision 1631, restricting exports from the Mono Basin to protect the basin and the tributaries feeding into Mono Lake. As a result of these measures and other commitments to protecting and enhancing the environment, approximately half of the historical average annual LAA supplies are being diverted for environmental enhancement projects.

The Lower Owens River Project, considered one of the most ambitious river restoration projects in the West, is in operation with 62 miles of the Lower Owens River having been dewatered. LADWP is working with Inyo County and other stakeholders on numerous restoration projects, including in-stream flow management in Rush, Lee Vining, Walker, and Parker creeks, restoration of Mono Lake water surface elevation, riparian restoration on the Upper Owens River, Convict, Mammoth, and McGee creeks, and dust mitigation measures on the Owens Lake bed.

Other Water Storage and Transfers

South Coast agencies continue to build relationships with other areas of the state via various storage and transfer programs. Under many of the storage and exchange agreements, imported water supplies are banked in groundwater aquifers in neighboring regions. These agreements are an essential component of the region's overall strategic planning to meet peak demand during the dry season.

Metropolitan has agreements with the Semitropic and Arvin-Edison Water Storage Districts which can result in the delivery of 197,000 acre-feet to Metropolitan over a 10-month period. Metropolitan can store portions of its SWP entitlements in the groundwater basins managed by these agencies during wet hydrologic conditions and retrieve the supplies when conditions are dry. Metropolitan's program with the San Bernardino Valley MWD yields between 20,000-80,000 acre-feet during dry years and permits Metropolitan to store up to 50,000 acre-feet of transfer water supplies in its groundwater basin. Metropolitan's programs with the Kern-Delta Water District and Mojave Water District operate in a similar manner. Dry-year yields for Metropolitan are 50,000 acre-feet and 35,000 acre-feet, respectively.

Some excess floodwater can be routed into the California Aqueduct through the Kern River Intertie. This water is transported from the Tulare Lake Hydrologic Region to the South Coast Hydrologic Region for water supply. Quantities are limited by the flow capability of the aqueduct and by available space in the SWP reservoirs in Southern California.

In addition to exchange agreements, Metropolitan is partnering with the Coachella Valley Water District (CVWD) and Desert Water Agency on an advance delivery agreement. The agreement allows Metropolitan to deliver exchange water in advance of receiving CVWD's and Desert Water Agency's SWP water. Metropolitan releases Colorado River water into the Whitewater River in Riverside which flows into the Coachella Valley and deep percolates into the groundwater basin. During dry hydrologic conditions, Metropolitan can take the CRA and SWP supplies for its partners until the banked water supplies are used. Through 2004, 177,400 acre-feet was banked in the groundwater basin.

CLWA has executed a long-term transfer agreement for 11,000 acre-feet per year with the Buena Vista and Rosedale-Rio Bravo water storage districts (WSD). These two districts, both in Kern County, joined to develop a program that provides a firm water supply and a water banking component. The supply is based on existing long-standing Kern River water rights, which would be delivered by exchange of SWP supplies.

In 1998, SDCWA entered into a transfer agreement with IID to purchase conserved agricultural water. Through the agreement, SDCWA will receive an annually increasing volume up to 200,000 acre-feet by 2021. The volume then remains fixed for the duration of the 75-year agreement.

In 2003, the QSA resulted in the movement of supplies between the Colorado River and South Coast regions. SDCWA was assigned rights to 77,700 acre-feet per year of water that will be conserved through lining of the All-American and Coachella canals in Imperial County. The canal-lining project has been completed and 77,700 acre-feet are being delivered to San Diego annually. Another 16,000 acre-feet per year of water conserved with the lining of the All-American Canal will go the San Luis Rey Indian Water Rights Settlement Parties.

Regional Water Planning and Management

There is a history of intra-regional integrated water management planning in the South Coast region. Water related challenges have been present for many years, including groundwater overdraft, seawater intrusion, brackish groundwater, water quality degradation problems, flooding, and dependence on decreasing supplies of imported state water. Over time, these challenges have led to collaboration among affected communities, agricultural users and other parties and necessitated development of a variety of projects and programs. With the advent of IRWM funding, the collaboration has increased and become more inclusive of interests previously not as involved in water management including those working towards improved habitat/ecosystem management and improvement of recreational opportunities. The Region has benefitted from this greater level of coordination and integration, which has also led to a more efficient use of local funding resources. Find more information on the DWR IRWM Web site: http://www.water.ca.gov/irwm/grants/index.cfm

Santa Clara Planning Area

The Upper Santa Clara River IRWMP identified objectives for implementation within the Watershed. The objectives generally apply to the Region as a whole and are meant to focus attention on the primary needs of the Region. The objectives are:

- Reduce Potable Water Demand: Implement technological, legislative and behavioral changes that will reduce user demands for water.
- Increase Water Supply: Understand future regional demands and obtain necessary water supply sources.
- Improve Water Quality: Supply drinking water with appropriate quality; improve groundwater quality; and attain water quality standards. Promote Resource Stewardship: Preserve and improve ecosystem health, and preserve and enhance water-dependent recreation.
- Flooding/Hydromodification: Reduce flood damage and/or the negative effects on waterways and watershed health caused by hydromodification and flooding out-side the natural erosion and deposition process endemic to the Santa Clara River.
- Take Action within the Watershed to Adapt to Climate Change
- Promote Projects and Actions that Reduce Greenhouse Gas Emissions

Santa Clara and Metropolitan Los Angeles Planning Areas

Integrated Regional Water Management Planning activities for the Santa Clara and Metropolitan Los Angeles Planning Areas have attracted stakeholders representing a wide range of agencies and organizations and causes. The agencies and organizations represented have interests in water supplies, wastewater, flood management, recreation and habitat protection. They include entities from the public, non-profit and private sectors. Despite the diversity in interests, the stakeholders realize that past differences must be set aside and collaborate on the planning and implementation of projects and policies which can have a positive benefit the regions. Planning activities examine regional as well as watershed issues, thereby addressing the needs and priorities across all major watersheds. Although collaboration among the regions is generally good, issues of overlap between IRWM region boundaries and coordination persist.

The group representing the Upper Santa Clara River Watershed IRWM group and the lower watershed Watersheds Coalition of Ventura County (WCVC) IRWMP group have met to coordinate their respective IRWMP activities, to share project ideas, and discuss watershed issues that are important to both watershed groups. The two groups meet on a regular basis.

Update 2009 reported on the projects which were still in the planning stages. However, much work has been accomplished since then.

Joint Projects

Calleguas Regional Salinity Management Project.

The Calleguas Regional Salinity Management Project (SMP) is a regional pipeline that will collect salty water generated by groundwater desalting facilities and excess recycled water and convey that water for reuse elsewhere. Any unused salty water will be safely discharged to the ocean, where natural salt levels are much higher. The SMP will improve water supply reliability by facilitating the development of up to 40,000 acre feet of new, local water supplies each year and expanding the distribution and use of recycled water from areas with abundant supplies to areas of need.

Fillmore Integrated Water Recycling and Wetlands Project

The City of Fillmore in Ventura County constructed a water-softening plant, a state-of-the-art wastewater treatment plant, and a recycled water distribution system. It also started a ban on new or replacement home brine discharging water softeners. Approximately 150 acre-feet per year of treated effluent is being recycled in local schools, parks and greenbelt areas, offsetting the demand for potable water.

Conversion of Septic Tanks to Sewers

Several communities in the Oxnard area of Ventura County were taken off septic systems and connected to sewers. Nearly 450 residential and commercial /industrial septic systems that had been discharging wastewater into local groundwater aquifers were taken off line, resulting in water quality improvements.

Arundo Removal

Additional removal projects of the evasive Arundo (giant reed) plant have been completed in several watersheds in Ventura County. All areas which have been cleared continue to be monitored and are subject to additional clearing operations if the reed begins to re-sprout. The objectives of removing the non-native invasive giant reed include restoring the native habitat, reducing flood hazards, reducing fire risks, improving water quality, and enhance groundwater recharge.

Development of Watershed Management/Protection Plans

Stakeholders in each of the three major watersheds (Calleguas Creek, Ventura River, Santa Clara River) have engaged in watershed-wide planning and management efforts. These efforts have included data collection and data gaps analysis through monitoring and modeling, identification of critical issues and problems, and identification of solutions in the form of action plans or project lists.

Regional Water Efficiency Program; Waterwise Garden Website

An online tool was developed to help property owners and managers to use water more efficiently on landscapes, including information on plant selection, efficient irrigation system design and irrigation maintenance strategies.

Santa Ana Planning Area

The Integrated Regional Water Management Region in the Santa Ana Planning Area also known as the SAWPA One Water One Watershed Plan covers northern Orange, a small section of southern Los Angeles, western Riverside, and southwestern San Bernardino counties. The participants represent a wide range of agencies, organizations, and interests; the contact database includes over 4,000 stakeholders. There is a high degree of integration and collaboration between the participants\stakeholders which includes water supply and wastewater agencies, other State and federal agencies, and local cities and counties. The representation also includes regional Indian Tribes and other local organizations. Planning within the Region occurs on regional as well as watershed basis – thereby addressing the needs and priorities across all the sub-region.

Projects

Major integrated regional water management projects that have been administered by SAWPA and funded by the State in the previous decade in the Santa Ana Planning Area are as follows:

Orange County Groundwater Replenishment System

Orange County Groundwater Replenishment System produces 70 million gallons per day (MGD) of highly treated wastewater for groundwater recharge and a seawater intrusion barrier. Located in the lower Santa Ana River Watershed, it is one of the largest water reclamation facilities west of the Mississippi River. Planning for the Phase II expansion to 100 MGD and an ultimate capacity of 130 MGD commenced in mid-2012.

Arlington Desalter Interconnection Project

The Project will improve water supply reliability in the region. It constructs a two-way intertie that will connect an existing portion of the City of Corona Department of Water and Power's (Corona) water system with the Western Municipal Water District's (WMWD) system.

Impaired Groundwater Recovery

The Project will recover and treat impaired groundwater to increase local drinking water supplies for the Irvine Ranch Water District (IRWD) service area to meet growing demands. The Project will supplement IRWD's current annual potable supplies, reduce demands of imported water, and increase IRWD's diversity of local supply.

Perchlorate Wellhead Treatment System Pipelines (WVWD)

The Project will remove perchlorate, nitrate, and trichloroethylene (TCE) from two contaminated drinking water production wells located in the Rialto-Colton Groundwater Basin. The project will construct the necessary piping to connect the Basin to the Groundwater Wellhead Treatment Plant (WTP).

Water Conservation Programs through Incentives

The Municipal Water District of Orange County (MWDOC) provides rebate incentives to their customers to reduce water consumption and encourage water conservation. MWDOC is targeting publicly owned and other commercial landscape properties to en-courage the removal of non-functional turf, upgrade antiquated irrigation timers to weather-based self-adjusting irrigation timers, and covert high-volume overhead spray irrigation to low-volume irrigation.

For Proposition 84 IRWM Round 1, the Santa Ana Watershed Protection Agency is moving forward with the following projects.

1. **Ground Water Replenishment System** – Flow Equalization Project. This project will more effectively utilize the available flow of secondary effluent from Orange County Sanitation District (OCSD) and maximize recourse processing and overall production from the GWRS.
2. **Sludge Dewatering, Odor Control, and Primary Sludge Thickening.** This project will make necessary improvements to Orange County Sanitation District's (OCSD) Plant No. 1 that supplies secondary effluent to the Orange Country Water Districts GRWS benefitting the region by creating natural supplies of potable water.
3. **East Garden Grove Wintersburg Channel.** This Urban Runoff and Treatment Project will divert up to 3 million gallons per day of dry weather urban runoff from the regional flood control channel draining a watershed area of over 22 square miles into an approximate 15-acre area in Huntington Beach Central Park for enhanced natural treatment using specialized wetland treatment trains and a reconstructed manmade lake system designed for polished treatment.
4. **Romoland A Flood System.** This project consists of two detention basins and approximately 11,800 feet of lineal open channel and storm drains designed to collect storm water and control runoff while removing debris, silt and other contaminates providing a solution for nonpoint source pollution.
5. **Santa Ana Watershed Vireo Monitoring.** This project provides data at a granularity that is needed for the permitting and continued operations of facilities located within riparian corridors within the Santa Ana River Watershed.
6. **Mill Creek Wetlands.** This project also known as the Cucamonga Creek Watershed Regional Water Quality Project focuses on improving water quality, preserving and enhancing the environment, improving regional integration & coordination, providing recreational opportunities, maintaining quality of life, and providing economically effective water solutions.
7. **Cactus Basin 3.**This project will reduce local flooding, reduce downstream flooding potential, and to reduce the size and cost of downstream drainage facilities.
8. **Inland Empire Brine Line Rehabilitation and Enhancement.** This project Lower Reach IVB will address Lower Reach IVB and extend the Brine Line's service life, meet new loading conditions and restore diminished capacity to the Lower Reach.
9. **Perris II Desalination Facility.** This project operated by Eastern Municipal Water District (EMWD) Project will supply brackish feed water to the existing Menifee and Perris I Desalters located within the Perris Valley, then ultimately supply brackish feed water to the Perris II Desalter (Planned operational by 2013) to make beneficial use of local degraded brackish groundwater in a long-term step in generating new local potable water resources.
10. **Chino Creek Wellfield Development.** The project is a component of the larger Chino Creek Wellfield (CCWF) Development Project and is part of the Chino Desalter Phase 3 Expansion which consists of the development of the three production wells, Wells 1, 2, and 3.

Other noteworthy multi-beneficial projects in the planning areas include the following:

1. **Go Gridless by 2020** – In February 2012, the Inland Empire Utilities Agency (IEUA)adopted a new initiative by which it aims to generate all the power it uses during peak electricity-usage hours by the Year 2020. IEUA is well on their way with the establishment of several improvements in wind, solar, fuel cell and food-waste to energy projects that are being implemented through public/private partnerships. Together, these projects generate over 10 megawatts of renewable energy for the agency.
2. **7 Oaks Dam Conservation and Garden Friendly Program** – Through a regional partnership of WMWD & SBVMWD , upper watershed agencies, new agreements between these two agencies to start the process to capture water behind 7 Oaks Dam for water conservation and allow water to be more readily recharged by downstream agencies. Agreements have been forged among not just SBVMWD and WMWD but also EMWD and IEUA and several other entities to create the Inland Empire Garden Friendly pro-gram to encourage more water efficient landscape irrigation practices that has been adopted by multiple landscapers and the business community including Home Depot.

San Diego Sub-region

The IRWM Region covers western San Diego, southern Orange, and southwestern Riverside counties. The stakeholders represent wide range of agencies, organizations, and interests in the region. There is a high degree of integration and collaboration between the stakeholders as evident by the formation of the Tri-County Funding Area Coordination Committee (Tri-FACC). The agencies represent water supply, wastewater, flood management, recreation and habitat protection entities in the public, non-profit and private sectors. Planning within the Region occurs on regional as well as watershed basis – thereby addressing the needs and priorities across all major water-sheds.

San Diego IRWM Projects

Since Update 2009, the IRWM groups are moving forward with a variety of different projects.

Santa Margarita Conjunctive Use Project

This project provides for enhanced recharge of the groundwater basin beneath the Marine Corps Base Pendleton in northern San Diego County. It also includes a seawater intrusion barrier using recycled water, a distribution system, and advanced water treatment facilities. This project will provide a new water supply of about 6,800 AF per year for Camp Pendleton and Fallbrook Public Utilities District and resolve a long-standing water rights dispute between Fallbrook and the federal government

Biofiltration Wetland Creation and Education Program

Through this project, the San Diego Zoological Society developed a bio-filtration wetland within the San Diego Zoo Safari Park that has improved water quality within the Park through natural biological filtration. Additional benefits include wetlands habitat enhancement, reduced water consumption and education for Park visitors about water conservation and wetlands.

North San Diego County Cooperative Demineralization Project

Sponsored by the San Elijo Joint Powers Authority, this project will construct advanced water treatment at the San Elijo Water Recreation Facility (SEWRF) for salinity management, production expansion, storm-water treatment, and pollution mitigation in the environmentally sensitive San Elijo Lagoon. The

SEWRF demineralization facility also will provide integral logistics and technical data to support current planning and design efforts for a future brackish water desalination facility.

Recycled Water Distribution System Expansion, Parklands Retrofit, and Indirect Potable Reuse / Reservoir Augmentation Project

This City of San Diego project comprises both traditional recycling projects (purple pipes) and support for advanced water treatment. More than 18,000 feet of new recycled water pipelines will be installed and 1,500 AFY of recycled water is projected to be delivered for irrigation purposes. It will also extend the existing recycled water distribution system to selected parklands and implement an advanced water treatment plant designed to demonstrate the ability to treat water for indirect potable reuse in the San Diego Region

Chollas Creek Runoff Reduction and Groundwater Recharge Project

With this project the County of San Diego set out to demonstrate the practical implementation of a range of low impact development (LID) practices with the goal of reducing runoff and providing groundwater recharge. Three County facilities in the Chollas Creek sub-watershed of the Pueblo San Diego hydrologic unit were selected for the demonstration.

Vail Lake Stabilization and Conjunctive Use Project

Rancho California Water District constructed a Transmission Main and Pump Station to convey untreated imported water from Metropolitan Water District of Southern California's (MWD) Pipeline No. 6 to Vail Lake. The facilities will convey imported untreated water acquired from MWD for storage in Vail Lake and subsequent groundwater recharge in the Upper Valle De Los Caballos Recharge Ponds. The project construction also includes Quagga Mussel Control Facilities because MWD raw water supply contains quagga mussels and Vail Lake is currently free of the invasive species.

Implementing Nutrient Management in the Santa Margarita River Watershed

This project is a joint effort between the Riverside County Flood Control and Water Conservation District and the County of San Diego. The goal of the project is to address nutrients in the Santa Margarita River Watershed that will help identify use of water quality objectives (WQOs). The project will collect data to support modeling in the SMR estuary and watershed in order to develop TMDLs and continue ongoing research to develop the estuarine nutrient numeric endpoint (NNE) framework, based on dissolved oxygen and macroalgae as endpoints.

Water Conservation Programs through Incentives

The Rancho California Water District (RCWD) provides rebate incentives to their customers to reduce water consumption and encourage water conservation. The program is focused on reducing water use by the district's agricultural clients through the implementation of on-farm water use efficiency strategies.

Accomplishments

The South Coast has a long history of regional water management and planning that has helped form the backbone of its current system. As the state's water resources continue to become more precious, the South Coast has continued to make significant regional accomplishments. These include the following.

Integrating Water Management Efforts

Recent developments in IRWM planning and collaboration have expanded the development of strategic, multi-benefit projects that meet regional water demands, improve water quality, and enhance environmental functions. Coordination of numerous stake-holders in development of the IRWM plans has been one of the biggest successes in the region. As a result, South Coast agencies acquired $135 million in Proposition 50 grant funding for local water resources projects.

Increasing Local Surface Storage

South Coast agencies are developing partnerships for reservoir construction, reoperation, and maintenance in order to meet water demands. The Carryover Storage and San Vicente Dam Raise project is a joint project by SDCWA and the City of San Diego to raise the existing dam at San Vicente Reservoir to provide 152 TAF in additional capacity.

Tri-County Funding Area Coordinating Committee

The Upper Santa Margarita Regional Water Management Group (RWMG), San Diego RWMG, and South Orange County RWMG collaborate in the San Diego Funding Area through a joint memorandum of understanding that established the inter-regional body known as the Tri-County Funding Area Coordinating Committee (FACC). Through this unprecedented effort, the FACC is working together to improve planning across regional boundaries and identify opportunities to support common goals and projects. In the most recent DWR implementation grant program for IRWM programs, the Upper Santa Margarita and San Diego RWMGs collaborated successfully to receive funding for a joint project to establish nutrient water quality objectives for the Sana Margarita River Watershed.

Recycled Water

The Groundwater Replenishment System in Orange County is undergoing an expansion which is scheduled for completion in 2014. When completed, the facility will have the capability of providing 103 TAF of recycled water supplies; an increase of 31 TAF from its current capacity. The project is a key component of long-term strategic water planning for the county which anticipates significant increases in population and water demands over the next two decades.

The City of Los Angeles recently completed its Recycled Water Master Plan which pro-vides a comprehensive strategy on how it can increase the use of recycled water sup-plies to 59 TAF by 2035. It identifies potential non-potable uses of the supplies such as landscape irrigation, cooling, and dust suppression at construction sites, groundwater replenishment actions (similar to those being implemented with the Groundwater Replenishment System in neighboring Orange County), and possible financing strategies for the activities.

Recycled water supplies are utilized at a number of projects within Los Angeles. These projects include landscape irrigation at Griffith Park, the Japanese Garden, Wildlife Preserve, and Lake Balboa sites within the Sepulveda Basin Recreation Area in the San Fernando Valley, and the Westside Water Recycling Project. The last project utilizes supplies from the Edward C. Little Water Recycling Facility which is operated by the West Basin Municipal Water District. In 2009, recycled water supply deliveries were 38 TAF.

Desalination

CA Water Plan Update 2009 provided an excellent summary of operational brackish groundwater desalination projects which are operational in the region. New facilities are still being planned for in the Eastern Municipal Water District's service area and on the Chino Basin. CA Dept of Public Health recently awarded State grant funds the Western Municipal Water District which will be used to expand the pumping capacity of the Chino I and Chino II desalting facilities.

Ocean or seawater desalination activities have increased since Update 2009. As mentioned earlier, San Diego County Water Authority board of directors approved the purchase of up to 56 TAF of water supplies from the, yet to be constructed, seawater desalination facility in the City of Carlsbad in November 2012. The agreement is with the private company, Poseidon Resources, which will build the facility; the agreement is for 30 years. The desalination facility, which will have a capacity to produce up to 50 MGD, will be constructed adjacent to the Encina Power Plant and will include a 10 mile pipeline to deliver the water supplies to the SDCWA Aqueduct. Separate agreements for water supply purchases will be initiated by the Vallecitos Municipal Water District and Carlsbad Municipal Water District, both are member agencies of the SDCWA. After financing is secured and construction gets underway, the facility is planning to commence start-up testing in 2015. Poseidon Resources is also working with the City of Huntington Beach, in Orange County, on a similar sized facility.

Testing is underway at the City of Long Beach Water Department's desalination facility to determine the feasibility of seafloor intake structure to pull in seawater and minimize the impacts on near shore coastal environment. A similar structure could be used in the discharge of brine by-product. The facility is scheduled to be on-line by the year 2020 and producing about 20 TAF of water supply annually.

A seawater desalination pilot project is underway for the Municipal Water District of Orange County's South Orange Coastal Ocean Desalination Project in the City of Dana Point. Slant wells are being installed on the shore in Dana Point and studied to determine if they are effective seawater intake structures for the yet to be constructed desalination facility. When built, the facility is expected to generate 16 TAF of supply annually.

The City of Oxnard completed construction on its state-of-the-art brackish groundwater desalination plant in 2008. It currently treats 7.5 MGD of brackish groundwater supplies.

Land Use Planning

Concurrently with the 2011 adoption of the City of Santa Clarita General Plan, the County of Los Angeles adopted the One Valley One Vision (OVOV) Santa Clarita Valley Area Plan. OVOV is a joint effort between the County, the City of Santa Clarita, and Santa Clarita Valley (Valley) residents and businesses to create a single vision and defining guidelines for the future growth of the entire Valley Planning Area. The OVOV effort is intended to achieve enhanced cooperation between the County and the City, coordinated land use planning, improved infrastructure and natural resource management, and enhanced quality of life for those who live and work in the Valley.

Controlling NPS Pollution

Local agencies are continuing to collaborate with Regional Water Boards on NPS pollution prevention, including development of public outreach campaigns to reduce pollutant loading as well as LID for more sustainable storm water management.

Hazard Mitigation Plans

The federal Disaster Mitigation Act of 2000 amended existing law with regards to hazard mitigation planning. The Act emphasizes pre-disaster mitigation and mitigation planning. In order to receive federal hazard mitigation funds in the future, all local jurisdictions must now adopt a hazard mitigation plan identifying hazards, risks, mitigation actions and priority and providing technical support for those efforts. Between 2004 and 2007, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, and Ventura counties adopted hazard mitigation plans and subsequently received Cal EMA approval.

Stormwater Capture\Groundwater Recharge

Sheldon-Arleta Methane Gas Collection Project

In 1998, a task force comprised of representatives from LADWP, other City of LA departments (Bureau of Sanitation (BOS), Bureau of Engineering, and Environmental Affairs) and the Upper Los Angeles River Area Watermaster was formed to review the issues surrounding the recharge of groundwater through spreading at the Tujunga Spreading Grounds. The objective of this Task Force was to maximize water spreading at the Tujunga Spreading Grounds without causing off-site landfill gas migration. An outcome of the Task Force was the Sheldon-Arleta Methane Gas Collection Project. The project is designed to restore the original Tujunga Spreading Grounds capacity of 250 cubic feet per second (cfs) with the potential for future enhancement by bringing the Tujunga Spreading Basins closest to the Sheldon-Arleta landfill back online. The Tujunga Spreading Grounds are located adjacent to the closed Sheldon-Arleta Landfill. During spreading operations, water displaces air from the ground potentially increasing migration of methane gas generated by the landfill. In the past, elevated levels of methane gas have been detected in the surrounding communities. Therefore, restrictions were enacted curtailing spreading operations to 20 percent of their original capacity. This project is a joint effort between LADWP and BOS to replace the methane gas collection system within the landfill and thereby contain methane gas onsite. The project is being implemented by LADWP through LABOS's Proposition "O" Clean Water Bond program. Proposition "O" funded approximately $3 million of the $9 million cost. Construction began in 2007 and was completed in November 2009.

Big Tujunga Dam – San Fernando Groundwater Enhancement Project.

LADWP and LACFCD approved a cooperative agreement on September 18, 2007 for the Big Tujunga Dam –San Fernando Groundwater Enhancement Project. This Project will in-crease stormwater capture and provide other benefits including improvements in flood prevention and environmental enhancement through seismically retrofitting the dam and spillway. Annual stormwater capture will increase by 4,500 AFY for a total capture amount of 6,000 AFY. The project is integrated with the following LADWP stormwater capture projects: Hansen Spreading Grounds Enhancement Project, Tujunga Spreading Grounds Enhancement Project, and the Sheldon-Arleta Methane Gas Collection Project. Both the Greater Los Angeles County Integrated Regional Watershed Management Plan and the Tujunga/Pacoima Watershed Plan are being incorporated into the Project. LADWP is contributing $9 million of the $105 million project cost. The project was completed in July 2011.

Hansen Spreading Grounds Enhancement Project

The Hansen Spreading Grounds is a 120 acre parcel located adjacent to the Tujunga Wash Channel downstream from the Hansen Dam. Under a cooperative agreement the LACFCD and LADWP propose to modernize the facility to increase intake and storage capacity thereby improving groundwater recharge, flood protection and water quality while providing recreational benefits and native habitat improvements.

To accomplish the goals of the project, a phased approach is being proposed. Phase 1A will deepen and reconfigure the existing basins; Phase 1B will improve the intake capacity by replacing a radial gate with a new rubber dam and telemetry system; and Phase 2 will develop other compatible uses such as recreational trails and native habitat for the community. Estimated recharge is 17,284 AFY, and estimated cost of this project is $10 million of which LADWP will fund $5 million. The Phase 1A reconstruction of the spreading grounds was completed in December 2009 and the Phase 1B intake structure will commence in May 2012 and should be completed by Oct 2012.

Tujunga Spreading Grounds Enhancement Project

The Tujunga Spreading Grounds Enhancement Project is designed to increase average annual stormwater capture by 8,000 AFY through relocating and automating the current intake structure on the Tujunga Wash, installation of an automated intake structure on the Pacoima Wash, and reconfiguration of the Tujunga Spreading Basins. Other multiple benefits include habitat improvements, passive recreation, educational opportunities, flood protection, and water quality improvements. Owned by LADWP, the Tujunga Spreading Grounds are operated by LACFCD in conjunction with other facilities along the Tujunga and Pacoima Wash Channels. Construction is expected to begin in early 2013 and finish by mid-2015.

In the Santa Ana Planning Area, extensive progress has been made in stormwater capture and groundwater recharge in both the upper watershed and lower watershed. In the upper watershed, agencies such as San Bernardino Valley Water Conservation District and the San Bernardino County Flood Control District have developed programs to expand and enhance groundwater recharge. These projects address State and regional priority goals for self-sufficiency and are consistent with recent legislation encouraging such practices. In the Chino Basin, as a result of funding from CA Prop 13 Water Bond to SAWPA, a total of 16 new and reconfigured flood control basins were constructed that allow for joint use as percolation basins of imported water and stormwater resulting in 100,000 AFY of new recharge. In the lower watershed, Orange County Water District has been able to expand their stormwater capture facilities along the Santa Ana River to now capture an average of 57,500 AFY based on the past 10 years.

Pala Wastewater Treatment Plant

Completed in April 2009, the wastewater treatment plant was a response to treat all wastewater generated within the reservation and all flows from the Pala Casino Spa and Resort. Though not mandated, the treatment plant meets California Department of Public Health, Title 22 criteria for unrestricted irrigation. In accordance with the Pala Band of Mission Indians continued environmental stewardship, the construction of the treatment plant included many sustainable elements.

Pala Band of Mission Indians Water Conservation Workshops

The Pala Band of Mission Indians Environmental Protection department holds regular water conservation workshops to educate reservation residents about indoor and outdoor water conservation and landscaping.

Challenges

With the South Coast region, population growth, water supply availability and reliability, water quality, and drought will continue to be key issues for the future.

Key Challenges

Resource Development

Water districts throughout the South Coast are engaged in integrated urban water management and groundwater planning. Decisions regarding development and expansion of other water supplies, such as recycled water and ocean desalination, will require more rigorous analysis of costs and tradeoffs between options.

Drought

Drought is a constant concern for water districts in the South Coast region. A drought simulation indicated that, under current management practices, a severe sustained drought would heavily impact the Colorado River (Harding et al. 1995). In some months, stretches of river would be completely dry in order to maintain reservoir storage elsewhere in the system. Potential repercussions of drought on imported water supply reliability have led to an emphasis on the development of local supplies and implementation of demand management strategies. Further, given the uncertainty of water imports in the future, local agencies are aggressively developing local alternatives and transfer agreements.

Climate Change

Climate change is expected to impact the South Coast region through changes in Statewide precipitation and surface runoff volume. More extreme storm events may exceed reservoir storage capacity and therefore result in allocated water supplies discharged to the ocean. Sea level rise may impact local aquifers and Delta water quality through seawater intrusion, as well as impact local coastal water and wastewater infrastructure. All of these uncertainties related to climate change could potentially reduce delivery of imported supplies and the ability of local agencies to meet South Coast water demand.

Sustainability

With the recognition that water resources management is a major component to sustainable development for the State, an overarching emphasis must be placed on the concept of integration in all water resource planning efforts. As water supply development is considered, the energy and greenhouse gas emission impacts must be addressed to assure that proposed water development projects are sustainable for the future.

Environmental Concerns in Delta

Uncertainty about the availability of imported water supplies from the Delta through the SWP is of primary concern to the South Coast region. A federal court found that a 2004 biological opinion by the USFWS does not adequately protect sensitive fish populations when authorizing long-term operations of the State and federal water projects. Further, significant restrictions were placed on SWP and Central Valley Project pumping in accordance with the December 2007 federal court imposed interim rules to protect the Delta smelt (Hypomesustranspacificus). Metropolitan and other stakeholders are reviewing the impact of the ruling and possible future solutions.

Groundwater Overdraft

Groundwater overdraft and lower groundwater levels are further water supply challenges to the region. Historically, agricultural, industrial, and urban development has led to increased groundwater pumping from many of the region's basins. Natural recharge is typically insufficient to maintain basin water levels and current pumping levels due to the extent of impervious surfaces and the presence of clay soils. In some basins, over-extraction of groundwater has caused lowering of groundwater tables and seawater intrusion, contributed to land subsidence, and resulted in legal solutions, adjudication, to resolve disputes over pumping rights within specific basins.

Watershed Protection

Strategic planning is needed to balance the water demands of the urban, agriculture, and environment sectors with the available water supplies in important watersheds in the region.

Runoff Management

Surface water quality issues in the region are dominated by storm water and urban runoff, which contribute contaminants to local creeks and rivers, lagoons, beaches, and bays. Shipping can also influence water quality, especially in San Diego Bay and the Long Beach and Los Angeles harbors, where there are toxic sediment hot spots. The Chino Basin faces substantial nutrient loading impacts from dairy farming, thereby impacting groundwater quality and downstream Santa Ana River quality.

Salinity

Salinity in both local and imported supplies will continue to be a challenge for local water agencies. Salinity sources in local groundwater supplies include concentration from agricultural tailwater, imported water, seawater intrusion, discharge of treated wastewater, and recycled water. Higher levels of treatment are also needed following long-range import of water supplies, as TDS levels are increased during conveyance. High salinity levels and perchlorate contamination contribute to degraded Colorado River supplies. Seawater intrusion and agricultural drainage threatens to increase the salinity of SWP supplies. The long-term salt balance of the region's groundwater basins is an increasingly critical management issue. Abandoned groundwater basins, due to high salinity levels, have only recently been restored through brackish water desalting projects.

Water Recycling

With its expansion of water recycling programs, the region continues to work to address issues related to TDS levels and constituents of emerging concern like pharmaceuticals, household products, and other products in treated wastewater that are not known to be harmful or are not regulated. The high salinity of imported Colorado River water limits the number of times water can be reused and wastewater can only be discharged to the ocean. Additionally, some inland water districts that use recycled water also have salt accumulation problems in their groundwater basins because they lack an ocean outfall or stream discharge.

Flood Control Infrastructure

Major challenges include maintenance of 100-year flood protection where it has been provided throughout the South Coast in light of continued urbanization and climate change. Major flood control projects in the Los Angeles, San Gabriel, and Santa Ana areas are threatened as urbanization in the upper watersheds adds to storm volumes. Local funding for flood maintenance and construction projects has become less effective in recent years because of several factors: Laws enacted in response to heightened public awareness of the need to protect the environment have increased the cost of upkeep and improvement; concern for endangered species has made scheduling more complex; both environmental and endangered species conditions have made permits more difficult to obtain; measures to reduce taxation, especially on property, have rendered revenue increases difficult to achieve, and inflation has increased costs. Meeting the requirements of these new restraints has become a high-profile local challenge. Concerns related to funding include invasive species, sediment in channels and reservoirs, decreasing levels of protection as runoff rates increase with urbanization and climate change, aging infrastructure, structural deficiencies of dams, and debris basins that are too small. Finally, adequate evaluation is needed of the long-term secondary impacts of environmental enhancements proposed for integration into flood control projects.

Water Costs

SWP contractors pay for the cost of constructing and operating facilities which store and convey SWP water supply, plus a transportation charge which covers the cost of delivery facilities. Thus, contractors in the South Coast pay higher transportation charges than those near the Delta. Metropolitan's 2009 Tier 1 rates for treated water total $579 per acre-foot and recovers the costs of purchasing, pumping, and delivering SWP and CRA supplies, as well as a surcharge for purchase of additional water transfers.

Local Flooding Impacts

Recurrent flooding is a problem in many places in the South Coast region. At many locations, lives, homes, business, farm lands, and infrastructure are frequently at risk. Providing better protection for lives and property remains the definitive flood management challenge. Solutions may range from governmental regulation of occupancy and building in flood-prone areas through local or watershed-based non-structural measures to infrastructure such as levees and reservoirs, constructed with consideration of environmental needs. Development of a discharge-based standard, such as protection from the flood having a 0.5 percent, 1 percent, or 2 percent probability of occurrence (or such a standard in conjunction with land use type or other pertinent factor) would facilitate equitable distribution of State and federal support funding.

Effects of Urbanization

Throughout the state, including this region, urbanization continues. It brings greater runoff due to increases of impervious area making retention of flood protection levels a challenging issue. Urbanization often causes increases in erosion and sedimentation. Construction of flood infrastructure or changes in land use may cause subsequent undesirable vegetation growth, whether of native or invasive species. Regulation of occupancy and land use is critical for reducing the number and severity of flood damage occurrences in an era of population growth. In this region, hillside flooding and flooding of developed low areas are special concerns, as is flooding in disadvantaged communities. Increased agricultural activity, an adjunct of population growth, may also increase erosion. Another particular concern in this region is flash flooding from steep watersheds, which has increasing impact as the population grows.

Preparedness for and Response to Flood Events

Effective preparedness for flood events depends on accurate evaluation of the risk, adequate measures for mitigation of flood damage, sufficient preparation for response and recovery activities and coordination among local, State, and federal agencies. Completion of floodplain mapping, both the FEMA Flood Insurance Rate Maps and the State's complementary Awareness Floodplain Mapping, will provide much needed information for evaluating flood risk. Mitigation may take many forms, including restriction of use, flood proofing, or structural protection of vulnerable sites. Some actions that help meet the challenge of response and recovery preparedness are organization for emergency management, formal agreement on responsibilities for emergency actions and funding, and use of warning systems.

Debris Flows

Wildfires may denude steep erodible slopes in canyons and upland areas above urban development below.

Ensuing winter rains may threaten these areas not only with high water, but also with debris flows. In these situations, flooding may cause greatly increased damages to structures and other installations and may leave large amounts of sediment and other detritus.

Stormwater Capture

The region's flood control systems are designed to quickly move storm flow through to the ocean. Managing these systems to retain flows to recharge aquifers where soft channel bottoms exist or diverting flow to off channel recharge basins provides an opportunity to enhance the supply of local water.

Invasive Species

Invasive species disrupt natural ecosystems by competing with native flora for limited resources and generally providing poor quality habitat for native fauna. The removal of Arundo and other invasive species offers numerous direct and indirect benefits to landowners, land managers, public agencies, and other Watershed residents. These benefits include reduction in risk of flooding and fire, improvements in water quality, increased water conservation, and restoration of habitat for native species, including several threatened and endangered species.

Drought and Flood Planning

The South Coast region is subject to severe repercussions from extreme weather events. Drought conditions both within and outside of the region can substantially limit water availability to urban and agricultural users. In contrast, extreme precipitation events can result in sudden and severe flooding and mud flows. This unusual paradox of concurrent drought and flooding is being addressed by the South Coast region's integrated regional planning efforts.

Drought Planning

Following consecutive years of above-average precipitation in the State, dry conditions settled in, peaking in the winter of 2008 and 2009. Coupled with the legal ruling on the Delta, wholesale and retail water responded with region-wide decisions and actions to mitigate the impacts. The Metropolitan Water District of Southern California utilized the guidelines from Water Surplus and Drought Management Plan, which was adopted in 1999, in its response to the dry conditions. The guidelines provide the framework for the coordination of delivery operations to member agencies of surplus or stored water supplies and the pursuit of transfer and banking programs and agreements to mitigate the impacts of any shortages. The conditions also prompted MWDSC to activate its Water Supply Allocation Plan for fiscal year 2009-2010. The WSAP is a component for the WSDMP and can be activated in the plan's critical shortage stages.

Retailed water agencies throughout the region, even those with diversified resources, responded aggressively to the challenges posed by these conditions. Many of the agencies have active water shortage contingency plans and ordinances and implemented the appropriate responses and measures based on their supply situation and decisions made by MWD on the imported supply allocations.

Drought Preparedness

Local agencies have been improving their ability to respond to droughts, based on the experiences of recent dry periods, steady improvement in the implementation and effectiveness of water use efficiency programs and policies, and utilization of other or alternative water supplies to meet demands. Many of these water agencies have prepared emergency response plans to respond to short- and long-term supply problems. Many of these are well-documented in management plans prepared in response to the Urban Water Management Planning Act.

Flood Planning

Most flood control districts in the South Coast region incorporate flood planning as a component in their flood management strategy. As described above, regional flood protection is sustained through an extensive network of flood control reservoirs, debris basins, flood channels, and levees; land use regulations, flood forecasting, and SEMS; and flood insurance. All counties in the region use the Automated Local Evaluation in Real Time (ALERT) system to notify the public of impending flood hazards. The Disaster Mitigation Act of 2000 required development of Hazard Mitigation Plans, which emphasize community partnerships in planning for and responding to disasters; assessing strategies for reducing risks; and identifying capabilities and resources for addressing various hazards. Each county in the South Coast region has an adopted Hazard Mitigation Plan.

Several other groups in the South Coast are addressing flood management programs and issues at the local level. VCWPD staff is looking into an integrated surface water and groundwater model of the entire county as an element of the IRWM Plan. The model would facilitate implementation of real-time flood forecasting, alert emergency personnel on impending flood flows, and calculate the water budget for all of the county's rivers/creeks and aquifers.

Some areas within the region have recently developed flood mitigation plans and a multi-hazard mitigation plans while others are partnering with FEMA to update flood hazard maps and also working on levee certification.

Looking to the Future

Future Conditions

Future Water Demand

In this section a description is provided for how future South Coast hydrologic region water demands might change under scenarios organized around themes of growth and climate change described earlier. The change in water demand in South Coast region from 2006 to 2050 is estimated for agriculture and urban sectors under 9 growth scenarios and 13 scenarios of future climate change. The climate change scenarios included the 12 Climate Action Team scenarios described earlier and a 13th scenario representing a repeat of the historical climate (1962-2006) to evaluate a "without climate change" condition.

Urban Demand

Figure SC-6 shows a box plot of change in urban water demand under 9 growth scenarios for South Coast region with variation shown across 13 scenarios of future climate including one scenario representing a repeat of the historical climate. A box plot is a graphical representation showing the minimum, 25th percentile, median, 75th percentile, and maximum values. The red dot shows the mean or average value. The change in water demand is the difference between the historical average for 1998 to 2005 and future average for 2043 to 2050. Urban demand is the sum of indoor and outdoor water demand where indoor demand is assumed not to be affected by climate. Outdoor demand, however, is dependent on climate factors like amount of precipitation falling and the average air temperature. Urban demand increased under all 9 growth scenarios tracking with population growth. On average, it increased by about 1210 thousand acre-feet under the three low population scenarios, 2100 thousand acre-feet under the three current trend population scenarios and about 3790 thousand acre-feet under the three high population scenarios when compared to historical average of about 3850 thousands-acre-feet. The results show change in future urban water demands are less sensitive to housing density assumptions or climate change than to assumptions about future population growth.

PLACEHOLDER Figure SC-6 Change in Urban Water Demand, South Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Agricultural Demand

Figure SC-7 shows a box plot of statewide change in agricultural water demand in the South Coast under 9 growth scenarios with variation shown across 13 scenarios of future climate including one scenario representing a repeat of the historical climate. A box plot is a graphical representation showing the minimum, 25th percentile, median, 75th percentile, and maximum values. The red dot shows the mean or average value. The change in water demand is the difference between the historical average for 1998 to 2005 and future average for 2043 to 2050. Agricultural water demand decreases under all future scenarios due to reduction in irrigated lands as a result of urbanization and background water conservation when compared with historical average water demand of about 790 thousand acre-feet. Under the three low population scenarios, the average reduction in water demand was about 160 thousand acre-feet while it was about 330 thousand acre-feet for the three high population scenarios. For the three current trend population scenarios, this change was about 210 thousand acre-feet. The results show that low density housing would result in more reduction in agricultural demand since more lands are lost under low-density housing than high density housing.

PLACEHOLDER Figure SC-7 Change in Agricultural Water Demand, South Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Integrated Water Management Plan Summaries

Inclusion of the information contained in IRWMP's into the Water Plan regional reports has been a common suggestion by regional stakeholders at the regional outreach meetings since the inception of the IRWM program. To this end, the California Water Plan update has taken on the task of summarizing readily available Integrated Water Management Plan in a consistent format for each of the regional reports. This collection of information will not be used to determine IRWM grant eligibility. his effort is ongoing and will be included in the final Water Plan updates and will include up to four pages for each IRWMP in the regional reports.

In addition to these summaries being used in the regional reports we intend to provide all of the summary sheets in one IRWMP Summary "Atlas" as an article included in Volume 4. This atlas will, under one cover, provide an "at-a-glance" understanding of each IRWM region and highlight each region's key water management accomplishments and challenges. The atlas will showcase how the dedicated efforts of individual regional water management groups (RWMGs) have individually and cumulatively transformed water management in California.

All IRWMPs are different in how they are organized. Therefore, finding and summarizing the content in a consistent way proved difficult. It became clear through these efforts that a process is needed to allow those with the most knowledge of the IRWMPs — those who were involved in the preparation — to have input on the summary. It is the intention that this process be initiated following release of Water Plan Update 2013 and will continue to be part of the process of the update process for California Water Plan Update 2018. This process will also allow for continuous updating of the content of the atlas as new IRWMPs are released or existing IRWMPs are updated.

As can be seen in Figure SC-8, there are 8 IRWM planning efforts ongoing in the South Coast Hydrologic Region.

PLACEHOLDER Figure SC-8 Integrated Water Management Planning in the South Coast Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Placeholder Text: At the time of the Public Review Draft the collection of information out of the IRWMPs in the region has not been completed. Below are the basic types of information this effort will summarize and present in the final regional report for each IRWMP available. An opportunity will be provided to those with responsibility over the IRWMP to review these summaries before the reports are final.

Region Description: This section will provide a basic description of the IRWM region. This would include location, major watersheds within the region, status of planning activity, and the governance of the IRWM. In addition, a IRWM grant funding summary will be provided.

Key Challenges: The top five challenges identified by the IRWM would be listed in this section.

Principal Goals/Objective: The top five goals and objectives identified in the IRWMP will be listed in this section.

Major IRWM Milestones and Achievements: Major milestones (Top 5) and achievements identified in the IRWMP would be listed in this section.

Water Supply and Demand: A description (one paragraph) of the mix of water supply relied upon in the region along with the current and future water demands contained in the IRWMP will be provided in this section.

Flood Management: A short (one paragraph) description of the challenges faced by the region and any actions identified by the IRWMP will be provided in this section.

Water Quality: A general characterization of the water quality challenges (one paragraph) will be provided in this section. Any identified actions in the IRWMP will also be listed.

Groundwater Management: The extent and management of groundwater (one paragraph) as described in the IRWMP will be contained in this section.

Environmental Stewardship: Environmental stewardship efforts identified in the IRWMP will be summarized (one paragraph) in this section.

Climate Change: Vulnerabilities to climate change identified in the IRWMP will be summarized (one paragraph) in this section.

Tribal Communities: Involvement with tribal communities in the IRWM will be described (one paragraph) in this section of each IRWMP summary.

Disadvantaged Communities: A summary (one paragraph) of the discussions on disadvantaged communities contained in the IRWMP will be included in this section of each IRWMP summary.

Governance: This section will include a description (less than one paragraph) of the type of governance the IRWM is organized under.

Resource Management Strategies

Volume 3 contains detailed information on the various strategies which can be used by water managers to meet their goals and objectives. A review of the resource management strategies addressed in the available IRWMPs is summarized in Table SC-10.

PLACEHOLDER Table SC-10 Resource Management Strategies addressed in IRWMP's in the South Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

Regional Resource Management Strategies

As alluded to in this chapter, water agencies in the South Coast Hydrologic Region have been implementing resource management strategies to satisfy the urban, agricultural, and environmental water demands within their respective service areas. Programs which have been implemented include the utilization of recycled water, water supply transfers and exchanges, the transfer of water supplies and the desalination of brackish groundwater.

Water supply transfers and exchanges have been important strategies utilized by water agencies to supplement their existing sources of supplies. Examples of these transfers and exchanges have been identified in other sections of this chapter.

Groundwater Desalination

Desalination of brackish groundwater supplies continue in the South Coast Hydrologic Region. This process permits water agencies utilize local water resources rather than relying on more costly imported supplies. In the Santa Clara Planning Area, the City of Oxnard's brackish groundwater desalter has been operational since 2008. In the Metropolitan Los Angeles Planning Area, the 3 MGD Goldsworthy Desalter, owned and operated by WRD, provides brackish groundwater desalination for the dual purposes of remediation of a saline plume located within the West Coast sub-basin and provision of a reliable local water source to Torrance.

This resource management strategy is heavily used in the Santa Ana area. The Arlington desalting facility provides is located near the City of Riverside and is owned and operated by Western Municipal Water District. The Chino Desalter Authority owns and operates the Chino I and II facilities. The Santa Ana Watershed Planning Authority assumed a key role in the construction of these facilities. The Arlington facility currently treats a little less than 6 TAF of brackish groundwater annually with a capacity to produce 7.8 TAF. The Chino facilities produce between 24 and 26 TAF operating at maximum capacity. A third facility for Chino will be operational in the near future and would produce an additional 13 TAF of water supply. The Eastern Municipal Water District operates the Menifee and Perris I desalters. A second facility in the Perris Valley will be operational by 2015. With the third facility, EMWD estimates that the desalters would provide 7.5 TAF annually with a capacity of 10.7 TAF.

Other desalting facilities in the Santa Ana area include the Temescal facility, by the City of Corona, the Irvine Desalter Project, a joint groundwater quality restoration project by IRWD and OCWD. The Temescal facility yields about 17 TAF and the Irvine Desalter Project yields 0.4 AFY of non-potable water supplies and 5 TAFY of potable water sup-plies which yields 7.7 TAFY of potable drinking water and 4 TAF acre-feet per year of non-potable water, and the Tustin Seventeenth Street Desalter, which is owned and operated by the City of Tustin, and yields approximately 2.1 AFY.

In the San Diego Planning Area, there are the City of Oceanside's Mission Basin Desalter (6.37 MGD) and Sweetwater Authority's Reynolds Groundwater Desalination Facility (4 MGD). In addition, the City of San Juan Capistrano owns and operates the Groundwater Recovery Plant (5 MGD) which will be utilized in the treatment of groundwater supplies contaminated by MTBE.

Recycled Water

The use of recycled water supplies continues to increase in the South Coast region. A number of factors are contributing to this increase. They include upgrades of existing and construction of new wastewater treatment facilities with the necessary equipment to treat and disinfect the supplies, better infrastructure (pipelines and reservoirs) to deliver the supplies to customers, and the implementation of programs to promote the use of these supplies.

Recycled water in the Santa Clara Planning Area will be an important water supply source in the near future. Recycled water supplies are being delivered by the Camrosa Water District, Camarillo Sanitation District, Triunfo Sanitation District, in conjunction with the Las Virgenes Municipal Water District, Ventura County Waterworks District No. 1, Santa Clarita Sanitation District, in conjunction with the Castaic Lake Water Agency, and Simi Valley Water Quality Control Plant. The City of Oxnard expects to be delivering recycled water from an advance water treatment facility currently under construction as part of its Oxnard Great Program. The supply is being utilized for landscape irrigation, industrial uses, and for the irrigation of non-edible commercial crops.

In the Metropolitan Los Angeles area, recycled water supplies are being utilized through-out. Within the City of Los Angeles, recycled water projects include landscape irrigation at Griffith Park, the Japanese Garden, Wildlife Preserve, and Lake Balboa sites within the Sepulveda Basin Recreation Area in the San

Fernando Valley, and the Westside Water Recycling Project. The last project utilizes supplies from the Edward C. Little Water Recycling Facility which is operated by the West Basin Municipal Water District. In 2009, about 38 TAF of recycled water supplies were delivered to different users throughout the city. The Edward Little Water Recycling Facility produced a little more 30 TAF in fiscal year 2009-2010 for customers inside and outside of its service area. For M & I customers within its service, which includes the Chevron Refinery, WBMWD delivered 15.5 TAF; it also delivered about 8 TAF for the West Coast Basin Seawater Barrier. In a multi-party agreement, WBMWD has agreed to recharge the barrier exclusively with recycled water supplies from its facility. The facility will be undergoing expansion in the near future for a fifth time (Phase V expansion).

In the Santa Ana area, the largest recycled water project is the Groundwater Replenishment System in Orange County. The facility is currently undergoing expansion, but Orange County Coastal Plain groundwater basin is being recharged annually with 72TAF of recycled water supplies. Water agencies with active recycled water programs include the Inland Empire Utilities Agencies (IEUA), Eastern Municipal Water District (EMWD), and Irvine Ranch Water District. All three agencies are moving ahead with plans to install the necessary facilities in order to deliver the supplies to potential customers within their respective service areas. IEUA reported a little less than 25 TAF of recycled water deliveries in 2009-2010, EMWD reported a little over 28 TAF in deliveries, and IRWD reported about 22 TAF.

Several wastewater reclamation facilities are in operation in the San Diego area. In San Diego County, recycled water use has proven to be and will continue to be reliable water supply source. In 2010, recycled water uses totaled about 28 TAF. By 2035, those uses are expected to increase to almost 50 TAF. The City of San Diego recently completed a pilot study to determine the feasibility of using recycled water supplies to augment non-recycled water supplies in local reservoirs. Data from the study are being analyzed for presentation to the City Council.

In the Temecula Valley of Riverside County, two facilities treat urban wastewater and are the source of recycled water supplies. The facilities are the Santa Rosa Water Reclamation Facility and the Temecula Valley Regional Water Reclamation Facility; both treat the wastewater flows to Title 22 requirements. For the Rancho California Water District, recycled water use in its service area was about 4.4TAF in 2010. Potential uses could increase that to 10.8 TAF by 2035.

Water Use Efficiency

Over 100 wholesale and retail urban water agencies in the South Coast region are signatories to the MOU Regarding Urban Water Conservation and members of the CUWCC. More importantly, these agencies are engaged in the implementation of the programs and policies collectively known as the urban best management practices. As a management tool, the BMPs are part of the overall strategy to address short-term is-sues, such as droughts, and long-term problems, such as meeting future demands with less than reliable supplies. In its 2010 Regional Urban Water Management Plan, the Metropolitan Water District of Southern California restated its goal of achieving 1.033 MAF of water supply savings from programs by the year 2025.

A variety of water use efficiency programs are being implemented in the region. These include rebates and direct installation programs for ultra-low flush and high efficiency toilets for residential and commercial customers, residential and commercial audit\surveys, and irrigation system audits for large landscape areas. Some are handled quite adequately by individual retail water agencies while the daily operations of others are handled by regional wholesale agencies.

In an effort to assist its member agencies with program implementation, Metropolitan continues to offer a blend existing (Water Conservation Credits program) and successful programs in addition new consumer assistance programs to help achieve water savings goals. The latest are the “SoCal WaterSmart” and “Save Water-Save A Buck.” Both provide partial rebates for the purchase of water efficient appliances, fixtures, and equipment for residential, commercial, and industrial customers within Metropolitan’s service area. There is also some flexibility in how the programs can be utilized. For SoCal WaterSmart, the Western Municipal Water District, and the City of Los Angeles Department of Water and Power (LADWP) use the program to assist their customers on the purchases of high-efficiency clothes washing machines. LADWP uses that same program to assist with rebates on the purchase of rotating nozzles, weather-based irrigation controllers, and for the implementation of a program that includes the removal of turf grass and installation climate-appropriate plants and other kinds of landscaping materials. The Save Water-Save A Buck program helps LADWP commercial and multi-family customers with the purchase of water efficient equipment and interior fixtures.

Examples of water use efficiency programs being implemented locally is the LADWP ultra-low flow and high efficiency toilet rebates for its single-family residential customers and Technical Assistance program which offers financial incentives for water saving projects and financial assistance for its CII customers.

Water supply conserving rate structures are slowly being developed and implemented in the region. An example of this pricing strategy is from the Irvine Ranch Water District. It began implementation of allocation based rate structure in 1991. Customized monthly water use bases are developed for each customer; adjustments are based on landscape and weather factors. Customers who exceed their allocations pay higher rates for their metered water supplies. Since its initiation, IRWD has noted reductions in water uses for landscape and residential customers; 31 percent for the landscape.

In addition to the treatment and deliver of water supplies, wholesale and retail water agencies are often the main source of information and news about water resources in the State and locally. This fact has prompted many wholesale and retail water agencies to have water education programs to serve in the municipal and industrial customers and schools within their respective service areas. The dissemination of information is handled in variety of different ways; from printed literature (technical reports to general information brochures), the media (DVDs), and utilization of the internet (websites with information and downloadable material). Some programs feature speaker bureaus (staff to make presentations at public events and school activities) and tours of water facilities. In during emergencies, provide information and updates to the appropriate local television, radio, newspaper, and internet services.

In addition to the array of programs targeting its M & I customers, the City of San Diego interacts with their customers by running annual water conservation film and poster contests. The city is one of several agencies to operate a water-efficient demonstration garden to provide suggestions on climate-appropriate plants and irrigation systems for residential and commercial landscaping. The garden is located on the campus of Cuyamaca Community College in southern San Diego County.

Pollution Prevention

Beneficial uses form the cornerstone of water quality protection under the Basin Plan. Once beneficial uses are designated, appropriate water quality objectives can be established and programs that maintain or enhance water quality can be implemented to ensure the protection of beneficial uses. The designated beneficial uses, together with water quality objectives (referred to as criteria in federal regulations), form water quality standards. Such standards are mandated for all waterbodies within the state under the California Water Code. In addition, the federal Clean Water Act mandates standards for all surface waters.

In many cases, protecting the quality of ground or surface waters (through protection of beneficial uses) results in protection of a local water supply that can help minimize the need for use of imported water. Regional Boards within the South Coast Hydrologic Region implement the following Resource Management Strategies either regularly through a variety of ongoing programs or through specific activities which occurred during 2009 – 2013.

The Water Boards implement a wide variety of pollution prevention activities and statewide policies have been established to address both point and nonpoint sources of pollution; many of these activities overlap with other resource management strategies described below. The Water Boards issue either individual or general National Pollutant Discharge Elimination System (NPDES) permits to prevent pollution from point source discharges. Development of Total Maximum Daily Loads (TMDLs) for impaired waterbodies, the incorporation of waste load and load allocations into permits, and the general enforcement of regulations all aid in pollution prevention as well. Additionally, regulation of hydromodification, or changes from the natural state of stream flows and channels, through the CWA Section 401 water quality certification program, aids in pollution prevention and protection of wetlands.

The Los Angeles Regional Board is also addressing nonpoint source pollution such as runoff from irrigated agriculture, impacts from onsite wastewater treatment systems (OWTS), pollution associated with marinas, and runoff from livestock and horse enclosures. In such cases, the Regional Board has the authority to protect water quality through WDRs, waivers of WDRs, or prohibitions.

Regional Boards may issue both categorical and individual waivers. In the case of categorical waivers, the Regional Board must approve and issue categorical waiver criteria either through adopting a specific resolution or Basin Plan amendment. Once a categorical waiver is approved by the Regional Board, Regional Board staff may be delegated the responsibility to review and approve categorical waivers. Four categorical waivers have been approved in the Region, as set forth in Resolution No. 53-5 (adopted in 1953). These are for septic tanks, swimming pool discharges, on-site drilling mud discharges from single oil wells, and discharges from private impoundments or lakes. Individual waivers are typically for construction or development projects that are short-term or one-time events.

The CWA Sections 303(d) and 305(b) contain backstop provisions designed to ensure that all state water quality standards are met including in waterbodies where existing permit effluent limitations and other water quality programs are not stringent enough to ensure achievement of water quality standards. The CWA Section 305(b) requires each State to assess the State's water resources every other year. These water quality assessments are reported to USEPA and are used to identify and list impaired waters, as required by Section 303(d). The resulting list is referred to as the 303(d) list. The State of California's 303(d) list is prepared per the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List. The 305(b) report and the 303(d) list are combined into the California 303(d)/305(b) Integrated Re-port.

The CWA also requires states to develop and implement TMDLs for the impaired waterbodies identified on the 303(d) list. A TMDL specifies the maximum amount of a pollutant that a water-body can receive and still meet water quality standards, and allocates pollutant loadings to point and non-point sources. A TMDL is also required to account for seasonal variations and include a margin of safety to address uncertainty in the analysis. TMDLs may be developed to address water quality, sediment quality, fish tissue or other impairments of beneficial uses.

States must develop plans to implement the TMDLs (40 CFR 130.6). The Regional Boards hold regulatory authority for many of the instruments used to implement the TMDLs, such as the NPDES permits and WDRs. The Los Angeles Regional Board has adopted or reconsidered ten TMDLs since 2009. A total of 43 TMDLs are in effect within the Los Angeles Region (including those established by USEPA).

Ecosystem Restoration

The Regional Board continues involvement in the Southern California Wetlands Recovery Project (WRP) which is a partnership of public agencies working cooperatively to acquire, re-store, and enhance coastal wetlands and watersheds between Point Conception and the Inter-national border with Mexico. Using a non-regulatory approach and an ecosystem perspective, the WRP works to identify wetland acquisition and restoration priorities, prepare plans for these priority sites, pool funds to undertake these projects, implement priority plans, and oversee post-project maintenance and monitoring. When compared to estimated historical acreages, Los Angeles County has lost 93% of its wetlands while Ventura County has lost 58% of its wetlands. Currently, the Project funds wetlands projects which involve planning, restoration, or acquisition. Some of the this region's wetlands given a high priority for funding include Los Cerritos Wet-lands, Malibu Lagoon, Ormond Beach Wetlands, and the Ventura River estuary.

Several major recent activities of the WRP have direct relevance to our wetlands protection efforts. The WRP participated in development of a method to assess the condition of wetlands, the California Rapid Assessment Method (CRAM). This method is in the process of being incorporated into monitoring for various regulatory programs such as 401 certifications. It will also serve as a major component of the Integrated Wetlands Regional Assessment Program (IWRAP) which is under development by the WRP in coordination with similar efforts elsewhere in the State. Other ongoing activities include the mapping of existing wetland and riparian acreages to serve as a baseline in the IWRAP and development of a Wetlands Tracker database to aid in tracking gains and losses of wetlands acres across both regulatory and non-regulatory programs.

Salt and Salinity Management

Recognizing that increased recycled water use could result in increased salt and nutrient loading to local groundwater basins, the SWRCB Recycled Water Policy requires every groundwater basin/sub-basin in the state to have a salt and nutrient management plan (SNMP). The intent of this requirement is to make certain that salts and nutrients from all sources are managed on a basin-wide or watershed-wide basis in a manner that ensures the attainment of water quality objectives and protection of beneficial uses.

Per the Recycled Water Policy, SNMPs shall be tailored to address water quality concerns in each basin and may include constituents other than salt and nutrients that adversely impact basin/sub-basin water quality. The policy also dictates that each salt and nutrient management plan includes:

- A basin/sub-basin wide monitoring plan that includes an appropriate network of monitoring locations to determine whether concentrations of salt, nutrients, and other constituents of concern are consistent with applicable water quality objectives.

- A provision for annual monitoring of Constituents of Emerging Concern
- Water recycling and stormwater recharge/use goals and objectives
- Salt and nutrient source identification, basin/sub-basin assimilative capacity and loading estimates, together with fate and transport of salts and nutrients.
- Implementation measures to manage salt and nutrient loading in the basin on a sustainable basis.
- An antidegradation analysis demonstrating that the projects included within the plan will collectively satisfy the requirements of the Antidegradation Policy (Resolution No. 68-16).

Implementation plans developed for those groundwater basins where water quality objectives for salts or nutrients are being, or are threatening to be, exceeded are expected to be adopted by the Regional Water Boards as Basin Plan amendments.

Urban Runoff Management

The Los Angeles Region manages municipal stormwater and urban runoff through issuance of NPDES permits for discharges from municipal separate storm sewer systems (MS4s), also called storm drain systems. There are currently three MS4 permits in effect within the Los Angeles Region: for discharges from MS4s within the County of Los Angeles, and the incorporated cities therein, except the City of Long Beach; for discharges from MS4s within the City of Long Beach; and for discharges from MS4s within the Ventura County Watershed Protection District, County of Ventura and the incorporated cities therein.

An important part of the municipal permits (Los Angeles County and City of Long Beach) are the Standard Urban Storm Water Mitigation Plans (SUSMPs) and numerical design standards for Best Management Practices (BMPs) The SUSMPs are designed to ensure that storm water pollution is addressed in one of the most effective ways possible, i.e., by incorporating BMPs in the design phase of new development and redevelopment. It provides for numerical design standards to ensure that storm water runoff is managed for water quality and quantity concerns. The purpose of the SUSMP requirements is to minimize, to the maximum extent practicable, the discharge of pollutants of concern from new development and redevelopment. The numerical design standard is that post-construction treatment BMPs be designed to mitigate (infiltrate or treat) storm water runoff from the first ¾ inch of rainfall, prior to its discharge to a storm water conveyance system.

Watershed Management

The watershed management RMS is the process of creating and implementing plans, programs, projects, and activities to restore, sustain, and enhance watershed functions. The Los Angeles Regional Board has a watershed coordinator staff person who has participated since 1996 in development and implementation of numerous plans, programs, projects, and activities led by local stakeholder organizations and agencies. The watershed coordinator also reports on watershed health through State of the Watershed Reports and develops a document (Watershed Management Initiative Chapter) which explains the Board's implementation of its regulatory programs on a watershed-scale, where appropriate. Watershed-based monitoring of the receiving waters is now required in permits for Publicly-owned Treatment Works (POTWs) within the Los Angeles and San Gabriel Rivers Watersheds and watershed-based monitoring programs are being developed in the Malibu Creek and Santa Clara River Watersheds. These programs are intended to coordinate with monitoring conducted by other entities in order to answer important watershed health questions while making more efficient use of limited public funds.

Stormwater Capture

The Los Angeles Department of Water and Power is preparing a Stormwater Capture Master Plan (Stormwater Plan) that will investigate potential strategies for advancement of stormwater and watershed management in the City of Los Angeles (City). The Stormwater Plan will be used to guide decision makers in the City when deciding how the City will develop both centralized and distributed stormwater capture goals. The Stormwater Plan will include evaluation of existing stormwater capture facilities and projects, quantify the maximum stormwater capture potential, develop feasible stormwater capture alternatives (i.e., projects, programs, potential policies, etc.), and provide potential strategies to increase stormwater capture. The Stormwater Plan will also evaluate the multi-beneficial aspects of increasing stormwater capture, including potential open space alternatives, improved downstream water quality, and peak flow attenuation in downstream channels, creeks, and streams such as the Los Angeles River.

The Stormwater Plan will recommend stormwater capture projects, programs, policies, and incentives for the City of Los Angeles.

Benefits of the Stormwater Plan include:

- Investigation of stormwater capture models such as the Groundwater Augmentation Model and the Watershed Management Modeling System to identify maxi-mum potential groundwater recharge.
- Increased water conservation.
- Improved water quality.
- Reduced peak flow in the Los Angeles River.

Project partners and supporters include:

- City of Los Angeles Department of Water and Power
- City of Los Angeles Department of Public Works
- County of Los Angeles Department of Public Works
- TreePeople, Inc.

A Request for Proposal for the Stormwater Plan was released in late 2011. The contract is anticipated to be awarded by March 2012, and completion of the Stormwater Plan will take approximately 24 months.

In the Santa Ana planning area, the following State water plan objectives are being addressed through the defined CA Water Plan water resource management strategies.

Reduce Water Demand

Urban Water Use Efficiency & Agricultural Water Use Efficiency – Under the SAWPA IRWM plan defined as “One Water One Watershed”, a water use efficiency pillar or workgroup was established of stakeholders to define the existing conditions, challenges and obstacles, goals and objectives, and strategies to improve water use efficiency throughout the watershed. A goal of reducing water use by 20% was established for the watershed. This will be primarily achieved through compliance with Senate Bill 7 – Statewide Water Conservation passed as part of the State Comprehensive Water Package in Nov. 2009. This legislation establishes one of the most progressive mandates to establish statewide water use efficiency standards in the State’s history and will result in significant water use efficiency for both urban and agricultural water suppliers. For the first time in California's history, this bill requires the development of agricultural water management plans and requires urban water agencies to reduce statewide per capita water consumption 20 percent by 2020.

Operational Efficiency and Transfers
Water Transfers – Under the most recent update to the OWOW Plan described as OWOW 2.0, a new pillar was established and described as the Operational Efficiency and Water Transfer Pillar. Under this pillar, SWOT (Strength, Weaknesses, Opportunities, and Threats) evaluations will be conducted in cooperation with the major water supply agencies in the watershed. From this analysis, areas of water resource strengths will be matched up areas of opportunities across the watershed to explore internal water transfers in order to optimize water availability and reliability.

Increase Water Supply
Conjunctive Management and Groundwater Storage, Desalination, Recycled Municipal Water, Surface Storage-Regional/Local – Under the adopted OWOW plan and the current OWOW 2.0 plan all aspects of increasing water supply have been examined and considered. A defined goal of drought proofed watershed by the Year 2030 has been established. A pillar group composed of multiple water, wastewater and groundwater management professionals has collaborated under the Water Resource Optimization Pillar to define specific implementation measures to assure sufficient water supplies to meet future demands. This pillar has conducted extensive investigation of the conjunctive management and groundwater storage availability, proposed increased desalination, defined plans for expanded municipal water recycling, and more surface storage in the region and locally to meet peak demands. Goals for these strategies include storing sufficient water to account for half of the watershed water demand for three year, reuse of all Santa Ana River flow at least once, capture and recharge of 80% of rainfall, and assuring adequate water supply and safe wastewater treatment and disposal.

Improve Water Quality
Drinking Water Treatment and Distribution, Groundwater Remediation/Aquifer Remediation, Matching Water Quality to Use, Pollution Prevention, Urban Runoff Management, Salt and Salinity Management – Under the adopted OWOW plan, a pillar workgroup composed of stakeholders across in the watershed with expertise in water quality, prepared a detailed evaluation of the current conditions, SWOT, and strategies necessary to achieve long term goals. For the Santa Ana watershed, the OWOW plan defined goals of meeting all water quality standards and removing salt from the watershed to improve salt balance. SAWPA has been a leader in working collaboratively on multiple projects to improve drinking water, cleaning up tainted or impaired groundwater basins, assuring beneficial uses are met, source control, working with the MS4 stormwater permittees in urban runoff management programs, and conducting one of the most progressive salinity management programs in the State with the construction of the 93 mile State's brine disposal pipeline to the ocean.

Practice Resources Stewardship
Land Use Planning and Management, Forest Management, Watershed Management – In the Santa Ana planning area, under OWOW planning a pillar workgroup was created for Water and Land Use Planning to address the need for better coordination among the community planning field and the water planning field to assure mutual benefits. Under OWOW 2.0, a new pillar was formed described as the Natural Resources Stewardship pillar which has outlined some very progressive strategies to improve resource stewardship. One of these programs conducted by SAWPA is called Forest First. Under an MOU with the

U.S. Forest Service, SAWPA and USFS will collaboratively work on projects in the watershed forest headwaters including: 1) Hazardous Fuels Reduction; 2) Meadow Restoration; 3) Chaparral Restoration on the Front Country above Recharge Areas; 4) Run-Off Reduction on Roads That Cross Forest Lands, and; 5) Removal of invasive species and restoration of native vegetation. Watershed management has been a long standing practice and mission of the Santa Ana Watershed Project Authority, administrator of the OWOW plan. For the Santa Ana planning area, the Santa Ana River watershed covers the same area. The OWOW plan reflects a regional integrated water resource plan as well as the watershed plan.

Improve Flood Management

Flood Risk Management – Under OWOW Plan 1.0, a pillar workgroup was established that specifically addresses flood risk management. The pillar workgroup consisting primarily of flood control districts and other interested parties who worked together to define current conditions, define SWOT and establish strategies to meet the OWOW mission and goals. The goal defined for flood risk management by the Year 2030 was to meet California FloodSAFE goals and construct soft bottom flood systems.

The California FloodSAFE program is a collaborative statewide effort designed to accomplish five broad goals:

1. Reduce the Chance of Flooding
2. Reduce the Consequences of Flooding
3. Sustain Economic Growth
4. Protect and Enhance Ecosystems
5. Promote Sustainability

FloodSAFE includes four major categories

A. Improve Emergency Response
B. Improve Flood Management Systems
C. Inform and Assist Public
D. Improve Operations and Maintenance

All Flood-SAFE program actions are designed to accomplish specific objectives that help satisfy the five goals.

Climate Change

For over two decades, the State and federal governments have been preparing for climate change effects on natural and built systems with a strong emphasis on water supply. Climate change is already impacting many resource sectors in California, including public health, water, agriculture, biodiversity, and transportation and energy infrastructure (CNRA, 2009; USGRCP, 2009). Climate model simulations, using the Intergovernmental Panel on Climate Change's 21st century climate scenarios, project increasing temperatures in California, with greater increases in the summer. Projected changes in annual precipitation patterns across California will result in changes to surface runoff timing, volume, and type (Cayan, 2008). Recently developed computer downscaling techniques indicate that California flood risks from warm-wet, atmospheric river type storms may increase beyond those that we have known historically, mostly in the form of occasional more-extreme-than-historical storm seasons (Dettinger, 2011).

Currently, enough data exist to warrant the importance of contingency plans, mitigation (i.e., reduction) of greenhouse gas (GHG) emissions, and incorporating adaptation strategies (i.e., methodologies and infrastructure improvements that benefit the region at present and into the future). While the State of California is taking aggressive action to mitigate climate change through reducing emissions from GHGs and implementing other measures (CARB, 2008), global impacts from carbon dioxide and other GHGs that are already in the atmosphere will continue to impact climate through the rest of the century (IPCC, 2007; UNEP, 2009).

Resilience to an uncertain future can be achieved by implementing adaptation measures sooner rather than later. Because of the economic, geographical, and biological diversity of California, vulnerabilities and risks from current and future anticipated changes are best assessed on a regional basis. Many resources are available to assist water managers and others in evaluating their region-specific vulnerabilities and identifying appropriate adaptive actions (USEPA and DWR, 2011; Cal-EMA and CNRA, 2012a).

Observations

Regionally-specific temperature data can be retrieved through the Western Regional Climate Center (WRCC)*. Locally in the South Coast hydrologic region within the WRCC South Coast climate region, mean temperatures have increased by about 1.9 to 3.0 °F (1.1 to 1.7 °C) in the past century, with minimum and maximum temperatures increasing by about 2.6 to 3.7 °F (1.4 to 2.1 °C) and by 1.1 to 2.3 °F (0.6 to 1.3 °C), respectively (WRCC, 2012). Within the WRCC Southern Interior climate region, mean temperatures have increased by about 1.0 to 2.2 °F (0.6 to 1.2 °C) in the past century, with minimum and maximum temperatures increasing by about 1.3 to 2.4 °F (0.7 to 1.3 °C) and by 0.7 to 2.1 °F (0.4 to 1.2 °C), respectively (WRCC, 2012). Statewide, California's temperature already has risen by 1 °F (0.6 °C), mostly at night and during the winter, with higher elevations experiencing the highest increase (DWR, 2008).

The South Coast region also is currently experiencing impacts from climate change through changes in statewide precipitation and surface runoff volumes, which in turn affect availability of local and imported water supplies. Many cities in the South Coast region experienced their lowest recorded annual precipitation at least twice within the past decade and a half (DWR, 2008). During the last century, the average early snowpack in the Sierra Nevada, which is an important source of water for the South Coast through the SWP and LAA, decreased by about ten percent, which equates to a loss of 1.5 million acre-feet of snowpack storage (DWR , 2008).

Water supplies coming from the Colorado River Basin outside of the State are also decreasing (CNRA, 2009). Similar climate effects, although much more variable, are occurring for the Rocky Mountains snowpack that supplies the Colorado River, another source of water for the South Coast region (Christensen, et al., 2004; Mote, et al., 2005; Williamson, et al., 2008; Guido, 2008). Even though variability exists in the snowpack levels of the Rocky Mountains, streamflows in the Colorado River appear to be peaking earlier in the year (Stewart, et al., 2005; Garfin, 2005), and the average water yield of the Colorado River could be reduced by 10 to 20 percent due to climate change (USBR, 2011).

Sea level rise degrades the quality of imported water from the Delta and impacts local coastal water and wastewater infrastructure, requiring substantial capital investments by local agencies. Sea level rise further exacerbates salinity intrusion and impacts coastal groundwater resources. According to the California Climate Change Center, sea level rose seven inches (18 cm) along California's coast during the past century (DWR, 2008; CNRA 2009).

The State's sea-level rise guidance documents reported that the coast of California experienced two very large El Niño Southern Oscillation (ENSO) events in 1983 and in 1997 to 1998, with costly storm damage to private property and public infrastructure. These damages occurred from a combination of elevated sea levels and large storm waves, which often coincided with high tides. During the 1983 ENSO event, sea levels were the highest ever recorded in San Diego and Los Angeles, 11.4 inches (29.0 cm) and 12.7 inches (32.3 cm), respectively, above predicted high tides.

Projections and Impacts

While historic data is a measured indicator of how the climate is changing, it can't project what future conditions may be like under different GHG emissions scenarios. Current climate science uses modeling methods to simulate and develop future climate projections. A recent study by Scripps Institution of Oceanography uses the most sophisticated methodology to date, and indicates by 2060-2069, temperatures will be 3.4 -4.9oF (1.9 -2.7oC) higher across the state than they were from 1985 to1994 (Pierce et al, 2012). By 2060-69, the annual mean temperature will increase by 3.8 °F (2.1 °C) for the WRCC South Coast climate region, with increases of 3.2 °F (1.8 °C) during the winter months and 4.3 °F (2.4 °C) during summer. The WRCC Southern Inland climate region has similar projections with annual mean temperatures increasing by 4.3 °F (2.4 °C), winter temperatures increasing by 3.4 °F (1.9 °C), and summer temperatures increasing by 4.9 °F (2.7 °C) (Pierce, et al., 2012). By the end of this century in 2100, mean temperatures are projected to increase about 5 to 6 °F (2.8 to 3.3 °C) during winter and up to 5 to 10 °F (2.8 to 5.6 °C) during summer (Cal-EMA and CNRA, 2012b) along the coast, with larger projected increases inland.

Changes in annual precipitation across California, either in timing or total amount, will result in changes to the type of precipitation (rain or snow) in a given area and to the timing and volume of surface runoff. Precipitation projections from climate models for the state are not all in agreement, but most anticipate drier conditions in the southern part of California, with heavier and warmer winter precipitation in the north (Pierce, et al., 2012). Because there is less scientific detail on localized precipitation changes, there exists a need to adapt to this uncertainty at the regional level (Qian, Y., et al, 2010).

Although annual precipitation will vary by area, reduced precipitation in the South Coast region will affect local reservoirs and the replenishment of the region's groundwater. Projections for the South Coast region indicate that low-lying coastal areas will lose 3 to 5 inches (8 to 13 cm) of precipitation by 2090, with western Riverside and southwestern San Bernardino Counties expected to see a 3.5 to 6-inch (9 to 15-cm) decline, while the mountain areas, like Big Bear, could see a drop of 8 to 10 inches (20 to 25 cm) (Cal-EMA and CNRA, 2012b).

On the other hand, extremes in California's precipitation are projected to increase with climate change. Recent computer downscaling techniques indicate that California flood risks from warm-wet, atmospheric river type storms may increase beyond those that we have known historically, mostly in the form of occasional more-extreme-than-historical storm seasons (Dettinger, 2011). Examples of such extremes were evident for the Los Angeles Civic Center and the San Diego Airport when they recorded 4.4 inches (11.2 cm) of rain (30 percent of normal) and 3.3 inches (8.4 cm) of rain (33 percent of normal) in water year 2002, respectively, while in water year 2005, they each recorded 37.5 inches (95.3 cm; 254 percent of normal) and 22.6 inches (57.4 cm; 222 percent of normal) (DWR, 2009). Winter runoff could result in flashier flood hazards, with flows potentially exceeding reservoir storage capacities and discharging to the ocean. Higher flow volumes will scour stream and flood control channels, degrading aquatic and riparian habitats already impacted by shifts in climate and placing additional stress on special-status species.

Low-lying farmlands, such as the Oxnard Plain, may also be inundated by sea water (Moser, et al., 2008; CNRA, 2009). For the California coast south of Cape Mendocino, the National Research Council projected that sea level will rise about 2 to 12 inches (4 to 30 cm) by 2030, 5 to 24 inches (12 to 61 cm) by 2050, and 17 to 66 inches (42 to 167 cm) by 2100 ((National Research Council [NRC], 2012)). The National Research Council also noted that as the projection period lengthens, uncertainties, and thus ranges, increase (NRC, 2012).Over the short-term, it is anticipated that El Nino Southern Oscillation (ENSO) events will be more damaging to the coastline than the gradual sea level rise California is experiencing (CO-CAT, 2010).

The Sierra Nevada snowpack is expected to continue to decline as warmer temperatures raise the elevation of snow levels, reduce spring snowmelt, and increase winter runoff. Locally in the South Coast region, the March snowpack in the Big Bear area is projected to decline from 2.5 inches (6.4 cm; 2010 level) to 1.4 inches (3.6 cm) in 2030 and to almost zero by 2090, with the San Gabriel Mountains decreasing from a 0.7-inch (1.8-cm) level in 2010 to zero by the end of the century (Cal-EMA and CNRA, 2012b). Such a decline in snowpack will impact the mountain communities dependent on tourism for their economies. In addition, earlier seasonal flows will reduce the flexibility in how the state manages its reservoirs to protect downstream communities from flooding while ensuring a reliable water supply.

Water supplies within California are already stressed because of current demand and expected population growth. About 85 percent of California's residents live and work in coastal counties, which are home to unique ecosystems that offer opportunities for recreation and tourism, provide habitat for rare species, and buffer coastal communities from flood and erosion (CNRA, 2009). Between 1980 and 2003, California's coastal population grew more than any other coastal community in the U.S. with a total increase of 9.9 million people (Crossett, et al., 2004; CNRA, 2009). By 2050, the coastal population is expected to grow to over 32 million people (NPA, 2000; CNRA, 2009). The uncertainty on the extent of these environmental changes will no doubt reduce the ability of local agencies to meet the water demand and protect infrastructure for the South Coast region, if these agencies are not adequately prepared.

Changes in climate and runoff patterns may create competition among sectors that utilize water. The agricultural demand within the region could increase due to higher evapotranspiration rates caused by increased temperatures. Prolonged drought and decreased water quality could diminish water-based recreational opportunities at South Coast reservoirs and streams, while rising sea levels, more intense wave actions, and changes in beach replenishment patterns could squeeze coastal recreation bounded by development and transportation systems (refer to Regional Management Strategy for Water-Dependent Recreation). Environmental water supplies would need to be retained in reservoirs for managing instream flows in order to maintain habitat for aquatic species throughout the dry season. Currently, Delta pumping restrictions are in place to protect endangered aquatic species. Climate change is likely to further constrain the management of these endangered species and the state's ability to provide water for other uses. For the South Coast region, this would further reduce supplies available for import through the SWP during the non-winter months (Cayan 2008; Hayhoe 2004).

With increasing temperatures, net evaporation from reservoirs is projected to increase by 15 to 37 percent (Medellin-Azuara, et al., 2009; CNRA, 2009). Prolonged drought events are likely to continue and further impact the availability of local and imported surface water and contribute to the depletion of groundwater supplies.

Higher temperatures and decreased moisture during the summer and fall seasons will increase the South Coast's vulnerability to wildfire hazards in the region and impact local watersheds. The extent to which climate change will alter the existing risk to wildfires is variable (Westerling and Bryant, 2006), and little change is projected for most of the region, which is already at a high fire risk (Cal-EMA and CNRA, 2012b). However, early snowmelt and drier conditions have been correlated with an increase in the size and intensity of these fires (Westerling, 2012), even though local Santa Ana winds are projected to decline in intensity (Hughes, et al., 2009; CNRA, 2009). Nevertheless, some areas, such as the San Jacinto Mountains (a mountain range between the South Coast and Colorado River regions), will likely have 1.5 to 2 times more fires (Cal-EMA and CNRA, 2012b).

Furthermore, wildfires have historically been linked to debris flow flooding in vulnerable communities within the South Coast region. The highly unpredictable nature of alluvial fans within the region has created flooding situations dependent on rain, vegetation, and wildfires (Stuart, 2012).

Adaptation

The South Coast region contains a diverse landscape with different climate zones, making it difficult to find one-size-fits-all adaptation strategies. Water managers and local agencies must work together to determine the appropriate planning approach for their operations and communities. While climate change adds another layer of uncertainty to water planning, it does not fundamentally alter the way water managers already address uncertainty (USEPA and DWR, 2011). However, stationarity (the concept that natural systems fluctuate within an unchanging envelope of variability) can no longer be assumed, so new approaches will likely be required (Milly, et al., 2008).

As the science of climate change quickly develops and evolves, local, state, and federal agencies face the challenge of interpreting new information and determining which methods and approaches are appropriate for their planning needs. The Climate Change Handbook for Regional Water Planning provides an analytical framework for incorporating climate change impacts into a regional and watershed planning process and considers adaptation to climate change (USEPA and DWR, 2011). This handbook provides guidance for assessing the vulnerabilities of California's watersheds and regions to climate change impacts, and prioritizing these vulnerabilities.

Adaptation strategies to consider for managing water in a changing climate include restoring existing flood control and riparian corridors, implementing tiered pricing to reduce water consumption and demand, increasing regional natural water storage systems, encouraging low impact development to reduce storm water flows, and promoting economic diversity and supporting alternative irrigation techniques within the agriculture industry. To further safeguard water supplies, other promising strategies include adopting more water-efficient cropping systems, investing in water saving technologies, and developing conjunctive use strategies. In addition, tracking forest health and reducing accumulated fuel load will provide a more resilient watershed ecosystem that can mitigate for floods, droughts, and fires. Developing adaptive management plans to address the impacts of sea level rise, preserving undeveloped and vulnerable shorelines, and facilitating gradual retreat of vulnerable infrastructure all help to be prepared for increasing rise in sea level. (DWR, 2008; Hanak and Lund, 2011; Cal-EMA and CNRA, 2012c; CNRA, 2012; Jackson, et al., 2012.)

In addition to the handbook mentioned above, the State of California has developed additional on-line tools and resources to assist water managers, land use planners, and local agencies in adapting to climate change. These tools and resources include the following:

- *2009 California Climate Adaptation Strategy* (http://resources.ca.gov/climate_adaptation/docs/Statewide_Adaptation_Strategy.pdf), which identifies a variety of strategies across multiple sectors (other resources can be found at http://www.climatechange.ca.gov/adaptation/strategy/index.html)
- *California Adaptation Planning Guide* (http://resources.ca.gov/climate_adaptation/local_government/adaptation_planning_guide.html), developed into four complementary documents by the California Emergency Management Agency and the California Natural Resources Agency to assist local agencies in climate change adaptation planning
- *Cal-Adapt* (http://cal-adapt.org/), an on-line tool designed to provide access to data and information produced by California's scientific and research community
- *Urban Forest Management Plan Toolkit* (www.UFMPtoolkit.com), sponsored by the California Department of Forestry and Fire Management to help local communities manage urban forests to deliver multiple benefits, such as cleaner water, energy conservation, and reduced heat-island effects
- *California Climate Change Portal* (http://www.climatechange.ca.gov/)
- *DWR Climate Change* website (http://www.water.ca.gov/climatechange/resources.cfm)
- *The Governor's Office of Planning and Research* website (http://www.opr.ca.gov/m_climatechange.php)

IRWM planning is a framework that allows water managers to address climate change on a smaller, more regional scale. Climate change is now a required component of all IRWM plans. IRWM regions must identify and prioritize their specific vulnerabilities, and identify adaptation strategies that are most appropriate for sub-regions. Planning strategies to address vulnerabilities and adaptation to climate change should be both proactive and adaptive, starting with low-regret strategies that benefit the region in the present-day, while adding future flexibility and resilience under uncertainty.

The San Diego Regional Water Management Group (RWMG) recognizes these opportunities and has begun collaborating with land use planners to update its IRWM plan. The Santa Ana Watershed Project Authority (SAWPA) has recognized the benefits forest watersheds provide to downstream communities and is working with the U.S. Forest Service on a variety of projects. In partnership with DWR, the California State University at San Bernardino – Water Resources Institute has developed a web-based portal for land use planning in alluvial fans, which uses an integrated approach in assessing hazards and resources (http://aftf.csusb.edu/; Lien-Longville, 2012).

The Los Angeles Regional Collaborative for Climate Action and Sustainability was formed as a network to share information, foster partnerships, and develop system-wide strategies to address climate change through sustainable communities (http://www.environment.ucla.edu/larc/). The San Diego Foundation developed a comprehensive regional assessment of climate change impacts to San Diego County and presented a public outreach brochure that not only discusses the impacts but also provides solutions to adapt to these impacts, including sea level rise, water shortages, and energy needs (Peters, et al. 2011).

In preparing for climate change, LADWP contracted a study to evaluate the effects of climate change on the LAA watershed. This study identified possible adaptation measures that could be implemented to mitigate the potential negative effects of climate change on the hydrology of the region, as well as the potential negative impact to water quality. These adaptation measures included creating new storage downgradient of Owens Valley during dry years and diverting water from the SWP at Neenach (AGU, 2011).

The Los Angeles County Flood Control District of the Department of Public Works (LACDPW), which is responsible for conducting groundwater replenishment operations, has initiated a basin study with the U.S. Bureau of Reclamation (USBR) for the Los Angeles Basin. This study will define options for meeting future water demands through increased capture of storm water in the Los Angeles Basin, determine where imbalances in supply and demand exist or are projected, and identify issues where changes to the operation of water supply systems, modifications to existing facilities, development of new facilities, or non-structural changes could help resolve water supply issues in a changing climate (LACDPW and USBR, 2012). SAWPA also is working with USBR on a basin study for its watershed region that will assess climate change impacts within the region in preparing an update to its One Water One Watershed IRWM Plan and that includes groundwater modeling and hydrology projections for the Santa Ana River Watershed (SAWPA, 2012).

Other RWMGs within the South Coast, such as the Watersheds Coalition of Ventura County and the Upper Santa Clara River Watershed, have initiated work on determining regional vulnerabilities and adaptation strategies and incorporating climate change into their IRWM planning processes. Central to adaptation in water management is full implementation of IRWM plans that address regionally appropriate practices that incorporate climate change adaptation. These IRWM plans, along with regional flood management plans, can integrate water management activities that connect corridors and restore native aquatic and terrestrial habitats to support the increase in biodiversity and resilience for adapting to changes in climate (CNRA, 2009).

Furthermore, cities are also becoming more pro-active. According to the Luskin Center for Innovation report, the City of Santa Monica has adopted a general plan element that addresses climate change. The City of Long Beach has a comprehensive climate planning within its Sustainable City Plan and is currently developing a general plan update that will incorporate climate change considerations, while the City of Irvine has an Energy Plan and a Draft Climate Action Plan, and is currently developing several climate and sustainability planning tools. Roughly one third of southern California cities have taken steps towards reducing GHG emissions but more work still needs to be done, not only in mitigating for but also in adapting to climate change. (DeShazo and Matute, 2012.)

MWD, a major South Coast wholesale supplier of water from the SWP and CRA, has been using an adaptive management approach in its Integrated Resources Plan (IRP). As part of its 2010 update of the IRP, MWD conducted a reliability analysis addressing potential climate change impacts and used the results to prioritize its management programs. Adaptive management is a suitable planning approach for MWD because its water supply system is subjected to multiple sources of uncertainty and relies heavily on imported water and because it wants to keep down its costs and to keep up water reliability for its South Coast water users (USEPA and DWR, 2011). Whatever approach is used, it is necessary for water managers and communities to start implementing adaptation measures sooner than later in order to be prepared for an uncertain future.

There are several Resource Management Strategies found in Volume 3 of the California Water Plan Update 2013 that not only assist in meeting water management objectives but also provide benefits for adapting to climate change, including the following:

- Agricultural and Urban Water Use Efficiency
- Water Transfers
- Conjunctive Management and Groundwater Storage
- Desalination
- Precipitation Enhancement
- Recycled Municipal Water
- Surface Storage – Regional/Local
- Drinking Water Treatment and Distribution
- Groundwater/Aquifer Remediation
- Pollution Prevention
- Salt and Salinity Management
- Agricultural Land Stewardship
- Economic Incentives
- Ecosystem Restoration
- Forest Management
- Land Use Planning and Management
- Recharge Area Protection
- Water-dependent Recreation
- Watershed Management
- Integrated Flood Management
- Sediment Management

The myriad of resources and choices available to managers can seem overwhelming, and the need to take action given uncertain future conditions is daunting. There are many low-regret actions that water managers in the South Coast region can take to prepare for climate change, regardless of the magnitude of future warming. These low-regret actions involve adaptation options where moderate levels of investment increase the capacity to cope with future climate risks (The World Bank, 2012).

Water managers and others will need to consider both the natural and built environments as they plan for the future. Stewardship of natural areas and protection of biodiversity are critical for maintaining ecosystem services important for human society, such as flood management, carbon sequestration, pollution remediation, and recreation. Land use decisions are central components in preparing for and minimizing the impacts from climate change (CNRA, 2009). Increased cross-sector collaboration among water managers, land use planners, and ecosystem managers provides opportunities for identifying common goals and actions needed to achieve resilience to climate change and other stressors. Strategies to manage local water supplies must be developed with the input of multiple stakeholders (Jackson, et al., 2012). While both adaptation and mitigation are needed to manage risks and are often complementary and overlapping, there may be unintended consequences if efforts are not coordinated (CNRA, 2009).

Mitigation

California's water sector has a large energy footprint, consuming 7.7% of statewide electricity (CPUC, 2010). Energy is used in the water sector to extract, convey, treat, distribute, use, condition, and dispose of water. Figure 3-26, Water-Energy Connection in Volume 1, CA Water Today shows all of the connections between water and energy in the water sector; both water use for energy generation and energy use for water supply activities. The regional reports in the 2013 California Water Plan Update are the first to provide detailed information on the water-energy connection, including energy intensity (EI) information at the regional level. This EI information is designed to help inform the public and water utility managers about the relative energy requirements of the major water supplies used to meet deman. Since energy usage is related to Greenhouse Gas (GHG) emissions, this information can support measures to reduce GHG's, as mandated by the State.

Figure SC-9 shows the amount of energy associated with the extraction and conveyance of 1 acre-foot of water for each of the major sources in this region. The quantity used is also included, as a percent. For reference, Figure 3-26, Water-Energy Connection in CA Water Today, Volume 1 highlights which water-energy connections are illustrated in Figure SC-9; only extraction and conveyance of raw water. Energy required for water treatment, distribution, and end uses of the water are not included. Not all water types are available in this region. Some water types flow by gravity to the delivery location and therefore do not require any energy to extract or convey (represented by a white light bulb).

Recycled water and water from desalination used within the region are not show in Figure SC-9 because their energy intensity differs in important ways from those water sources. The energy intensity of both recycled and desalinated water depend not on regional factors but rather on much more localized, site, and application specific factors. Additionally, the water produced from recycling and desalination is typically of much higher quality than the raw (untreated) water supplies evaluated in Figure SC-9. For these reasons, discussion of energy intensity of desalinated water and recycled water are included in Volume 3, Resource Management Strategies.

Energy intensity, sometimes also known as embedded energy, is the amount of energy needed to extract and convey (Extraction refers to the process of moving water from its source to the ground surface. Many water sources are already at ground surface and require no energy for extraction, while others like groundwater or sea water for desalination require energy to move the water to the surface. Conveyance refers to the process of moving water from a location at the ground surface to a different location, typically but not always a water treatment facility. Conveyance can include pumping of water up hills and mountains or can occur by gravity.) an acre-foot of water from its source (e.g. groundwater or a river) to a delivery location, such as a water treatment plant or a State Water Project (SWP) delivery turnout (Energy from low-head pump lifts (less than 50 feet) used to divert water out of river channels or canals has been excluded from the calculations.). Energy intensity should not be confused with total energy—that is, the amount of energy (e.g. kWh) required to deliver all of the water from a water source to customers within the region. Energy intensity focuses not on the total amount of energy used to deliver water, but rather the energy required to deliver a single unit of water (in kWh/acre-foot). In this way, energy intensity gives a normalized metric which can be used to compare alternative water sources.

In most cases, this information will not be of sufficient detail for actual project level analysis. However, these generalized, region-specific metrics provide a range in which energy requirements fall. The information can also be used in more detailed evaluations using tools such as WeSim (http://www.pacinst.org/publication/wesim/) which allows modeling of water systems to simulate outcomes for energy, emissions, and other aspects of water supply selection. It's important to note that water supply planning must take into consideration a myriad of different factors in addition to energy impacts; costs, water quality, opportunity costs, environmental impacts, reliability and other many other factors.

Energy intensity is closely related to Greenhouse Gas (GHG) emissions, but not identical, depending on the type of energy used (see CA Water Today, Water-Energy, Volume 1). In California, generation of 1 megawatt-hour (MWh) of electricity results in the emission of about 1/3 of a metric ton of GHG, typically referred to as carbon dioxide equivalent or CO2e (eGrid, 2012). This estimate takes into account the use of GHG-free hydroelectricity, wind, and solar and fossil fuel sources like natural gas and coal. The GHG emissions from a specific electricity source may be higher or lower than this estimate.

Reducing GHG emissions is a State mandate. Water managers can support this effort by considering energy intensity factors, such as those presented here, in their decision making process. Water use efficiency and related best management practices can also reduce GHGs (See Volume 2, Resource Management Strategies).

Accounting for Hydroelectric Energy

Generation of hydroelectricity is an integral part of many of the state's large water projects. In 2007, hydroelectric generation accounted for nearly 15% of all electricity generation in California. The State Water Project, Central Valley Project, Los Angeles Aqueduct, Mokelumne Aqueduct, and Hetch Hetchy Aqueducts all generate large amounts of hydroelectricity at large multi-purpose reservoirs at the heads of each system. In addition to hydroelectricity generation at head reservoirs, several of these systems also generate hydroelectric energy by capturing the power of water falling through pipelines at in-conduit generating facilities (In-conduit generating facilities refer to hydroelectric turbines that are placed along pipelines to capture energy as water runs downhill in a pipeline (conduit)). Hydroelectricity is also generated at hundreds of smaller reservoirs and run-of-the-river turbine facilities.

Hydroelectric generating facilities at reservoirs provide unique benefits. Reservoirs like the State Water Project's Oroville Reservoir are operated to build up water storage at night when demand for electricity is low, and release the water during the day time hours when demand for electricity is high. This operation, common to many of the state's hydropower reservoirs, helps improve energy grid stabilization and reliability and reduces GHG emissions by displacing the least efficient electricity generating facilities. Hydroelectric facilities are also extremely effective for providing back-up power supplies for intermittent renewable resources like solar and wind power. Because the sun can unexpectedly go behind a cloud or the wind can die down, intermittent renewables need back up power sources that can quickly ramp up or ramp down depending on grid demands and generation at renewable power installations.

Despite these unique benefits and the fact that hydroelectric generation was a key component in the formulation and approval of many of California's water systems, accounting for hydroelectric generation in energy intensity calculations is complex. In some systems like the SWP and CVP, water generates electricity and then flows back into the natural river channel after passing through the turbines. In other systems like the Mokelumne aqueduct water can leave the reservoir by two distinct out flows, one that generates electricity and flows back into the natural river channel and one that does not generate electricity and flows into a pipeline flowing into the East Bay Municipal Utility District service area. In both these situations, experts have argued that hydroelectricity should be excluded from energy intensity calculations because the energy generation system and the water delivery system are in essence separate (Wilkinson, 2000).

DWR has adopted this convention for the energy intensity for hydropower in the regional reports. All hydroelectric generation at head reservoirs has been excluded from Figure SC-9. Consistent with Wilkinson (2000) and others, DWR has included in-conduit and other hydroelectric generation that occurs as a consequence of water deliveries, such as the Los Angeles Aqueduct's hydroelectric generation at San Francisquito, San Fernando, Foothill and other power plants on the system (downstream of the Owen's River Diversion Gates). DWR has made one modification to this methodology to simplify the display of results: energy intensity has been calculated at each main delivery point in the systems; if the hydroelectric generation in the conveyance system exceeds the energy needed for extraction and conveyance, the energy intensity is reported as zero (0). I.e., no water system is reported as a net producer of electricity, even though several systems do produce more electricity in the conveyance system than is used (e.g., Los Angeles Aqueduct, Hetch Hetchy Aqueduct). (For detailed descriptions of the methodology used for the water types presented, see Technical Guide, Volume 5).

PLACEHOLDER Figure SC-9 Energy Intensity of Raw Water Extraction and Conveyance in the South Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the report.]

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Additional References

Personal Communications

Table SC-1 South Coast Hydrologic Region Yearly Regional Temperature and Precipitation

Year	Ave. Temps Maximum (F°)	Ave. Temps Minimum (F°)	Average Daily Temperatures (F°)	Average Precipitation (in)	Average ETo (in)
2005	73.84	50.16	60.97	17.48	51.16
2006	75.35	49.53	61.43	9.91	50.72
2007	74.60	48.99	60.72	6.24	52.95
2008	75.77	50.28	60.11	10.07	51.76
2009	75.77	50.01	61.89	5.25	51.48
2010	73.25	48.89	59.80	19.12	51.24

Source: California Irrigation Management Information System

Table SC-2 South Coast Hydrologic Region Top Crops 2009 (in acres)

(DRAFT this table will be updated)

Crop	Acres
Citrus and Subtropical*	124,200
Nursery and Cut Flowers	18,500
Pasture and Turf	11,700
Celery	11,100
Wheat and Small Grains	6,100
Tomatoes	4,300
Asian Specialty Vegetables	3,800
Citrus and Subtropical*	124,200
Nursery and Cut Flowers	18,500

Source: DWR and County Agricultural Commissioner Annual Reports

*Includes avocados

Table SC-3 Key elements of the Law of the Colorado River

Document	Date	Main Purpose
Colorado River Compact	1922	The Upper and Lower Basin are each provided a basic apportionment of 7.5 MAF annually of consumptive use. The Lower Basin is given the right to increase its consumptive use by an additional 1.0 MAF annually.
Boulder Canyon Project Act	1928	Authorized USBR to construct Hoover Dam and the All-American Canal (including the Coachella Canal), and gave congressional consent to the Colorado River Compact. Apportioned the Lower Basin's 7.5 MAF among the states of Arizona (2.8 MAF), California (4.4 MAF), and Nevada (0.3 MAF). Provided that all users of Colorado River water stored in Lake Mead must enter into a contract with USBR for use of the water.
California Limitation Act	1929	Confirmed California's share of the 7.5 MAF Lower Basin allocation to 4.4 MAF annually, plus no more than half of any surplus waters.
California Seven-Party Agreement	California Seven-Party Agreement	An agreement among seven California water agencies/districts to recommend to the Secretary of Interior how to divide use of California's apportionment among the California water users.
US-Mexican Water Treaty	1944	Apportions Mexico a supply of 1.5 MAF annually of Colorado River water, except under surplus or extraordinary drought conditions.
US Supreme Court Decree in Arizona v. California, et al.	1964, supplemented 1979	Rejected California's argument that Arizona's use of water from the Gila River, a Colorado River tributary, constituted use of its Colorado River apportionment. Ruled that Lower Basin states have a right to appropriate and use tributary flows before the tributary co-mingles with the Colorado River. Mandated the preparation of annual reports documenting the uses of water in the three Lower Basin states. Quantifies tribal water rights for specified tribes, including 131,400 afy for diversion in California. Quantified Colorado River mainstream present perfected rights in the Lower Basin states.
Colorado River Basin Project Act	1968	Authorized construction of the Central Arizona Project. Requires Secretary of the Interior to prepare long-range operating criteria for major Colorado River reservoirs.
Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs	1970, amended 2005	Provided for the coordinated operation of reservoirs in the Upper and Lower Basins and set conditions for water releases from Lake Powell and Lake Mead.
Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement of 2003	2003	Complex package of agreements that, in addition to many other important issues, further quantifies priorities established in the 1931 California Seven-Party Agreement and enables specified water transfers (such as the water conserved through lining of the All-American and Coachella canals to SDCWA) in California.

Source: Adapted from USBR 2008c

Table SC-4 Annual Per Capita Water Use By Planning Area South Coast Hydrologic Region

Region	Per Capita Water Use 2006	Per Capita Water Use 2007	Per Capita Water Use 2008	Per Capita Water Use 2009
Santa Clara	200	181	194	202
Metropolitan L. A.	178	165	157	147
Santa Ana	241	227	208	200
San Diego	199	209	209	156

Source: Bulletin 160-2013 Regional Water Balances (Preliminary)

Table SC-5 Breakdown of Water System Size

Water System Size	Number of Community Systems	Percent Number of community in Region	Population Served	Percent of Population served
Large (> 10,000 Pop)	181	41 %	19,456,617	98 %
Medium (3301 - 10,000 Pop)	57	13 %	358,422	1.8 %
Small (500 - 3300 Pop)	66	15 %	94,231	0.5 %
Very Small (< 500 Pop)	116	26 %	19,437	0.1 %
CWS that Primarily Provide	19	4 %	---	---
TOTAL	439		19,928,707	

1. Running Springs Water District's (System No. 3610062) service area is in both the South Lahontan & South Coast Regions. To avoid duplication it is only included in the South Lahontan Region.

2. Julian Community Services District's (System No. 3700909) service area is in both the Colorado River & South Coast Regions. To avoid duplication it is only included in the Colorado River Region.

Table SC-6 Summary of Contaminants affecting Community Drinking Water Systems in the South Coast Hydrologic Region

Principal Contaminant (PC)	Community Drinking Water Systems where PC exceeds the Primary MCL	No. of Community Drinking Water Wells where PC exceeds the Primary MCL
Nitrate	81	270
Perchlorate	47	166
Gross alpha particle activity	47	89
Tetrachloroethylene (PCE)	40	141
Trichloroethylene (TCE)	38	146
Arsenic	26	44
Uranium	18	35
Carbon tetrachloride	16	51
Fluoride	14	29
1,1-Dichloroethylene (1,1-DCE)	9	35
1,2-Dichloroethane (1,2-DCA)	9	23
1,2-Dibromo-3-chloropropane (DBCP)	7	29

Source: Water Boards 2012 Draft Report on "Communities that Rely on Contaminated Groundwater"

Notes: Only the 12 most prevalent contaminants are shown. 276 of the 584 affected wells have multiple contaminants. 158 wells are affected by Nitrate and other contaminant(s). 134 wells are affected by Perchlorate and other contaminant(s). 97 wells are affected by both Nitrate and Perchlorate contamination.

Table SC-7 Summary of Community Drinking Water Systems in the South Coast Hydrologic Region Relying on One or More Contaminated Groundwater Well That Exceeds a Primary Drinking Water Standard

	Small Systems ≤ 3,300	Medium Systems 3,301 - 10,000	Large Systems ≥ 10, 000	Total
No. of Affected Community Drinking Water Systems	43	20	99	162
No. of Affected Community Drinking Water Wells	73	35	476	584

Source: Water Boards 2012 Draft Report on "Communities that Rely on Contaminated Groundwater"

Table SC-9 Record floods for selected streams, South Coast Hydrologic Region

Stream	Location	Mean annual runoff (taf)	Peak stage of record (ft)	Peak discharge of record (cfs)
Cottonwood Cr.	above Tecate Creek, near Dulzura5	11	11.2	11,700
San Diego R.	at Fashion Valley, at San Diego	282	13.5	9,430
San Diego R.	at Mast Road, near Santee	18	18.1	45,400
Santa Ysabel Cr.	near Ramona	8	14.3	28,400
San Luis Rey R.	at Oceanside	26	21.7	25,700
Santa Margarita R.	at Ysidora	452	20.5	44,000
Santa Margarita R.	near Temecula	212	22.5	31,000
Temecula Cr.	near Aguanga	6	14.6	8,100
Murrieta Cr.	at Temecula	152	17.2	25,000
San Juan Cr.	at La Novia Street Bridge, at San Juan Capistrano	16	20.71	28,500
Santa Ana R.	at Santa Ana	572	9.0	31,700
Temescal Cr.	above Main Street, at Corona	242	6.7	4,720
San Jacinto R.	near Elsinore	12	11.8	16,000
Salt Cr.	at Murrieta Road, near Sun City	2	11.23 1	4,120
San Jacinto R.	near San Jacinto	14	5.31	45,000
Santa Ana R.	at MWD Crossing, near Arlington	1152	16.6	47,800
Lytle Cr.	at Colton	6	14.8	17,500
San Timoteo Cr.	near Loma Linda	3	8.2	15,000
San Gabriel R.	below Santa Fe Dam, near Baldwin Park	47	22.2	30,900
Rio Hondo	below Whittier Narrows Dam	125	13.8	38,800
Rio Hondo	at South Gate6	38	15.4	48,100
Big Tujunga Cr.	below Hansen Dam	182	7.6	15,200
Los Angeles R.	at Long Beach6	194	18.3	128,700
Los Angeles R.	at Sepulveda Dam	39	12.11	14,700
Ballona Cr.	at Culver City6	36	16.0	32,500
Malibu Cr.	at Malibu Canyon6	21	21.4	33,800
Calleguas Cr.	near Camarillo	37	10.51	25,900
Santa Clara R.	at Montalvo3	122	17.4	165,000

Sespe Cr.	near Fillmore	93	25.01,4	85,300
Piru Cr.	above Frenchmans Flat	31	n/a	36,000
Santa Clara R.	near Piru	55	12.71	32,000
Ventura R.	near Ventura	512	29.31	63,600

Note: Note: taf = thousand acre-feet; ft = feet; cfs = cubic feet per second

1 Different date than peak discharge

2 Most recent but less than period of record

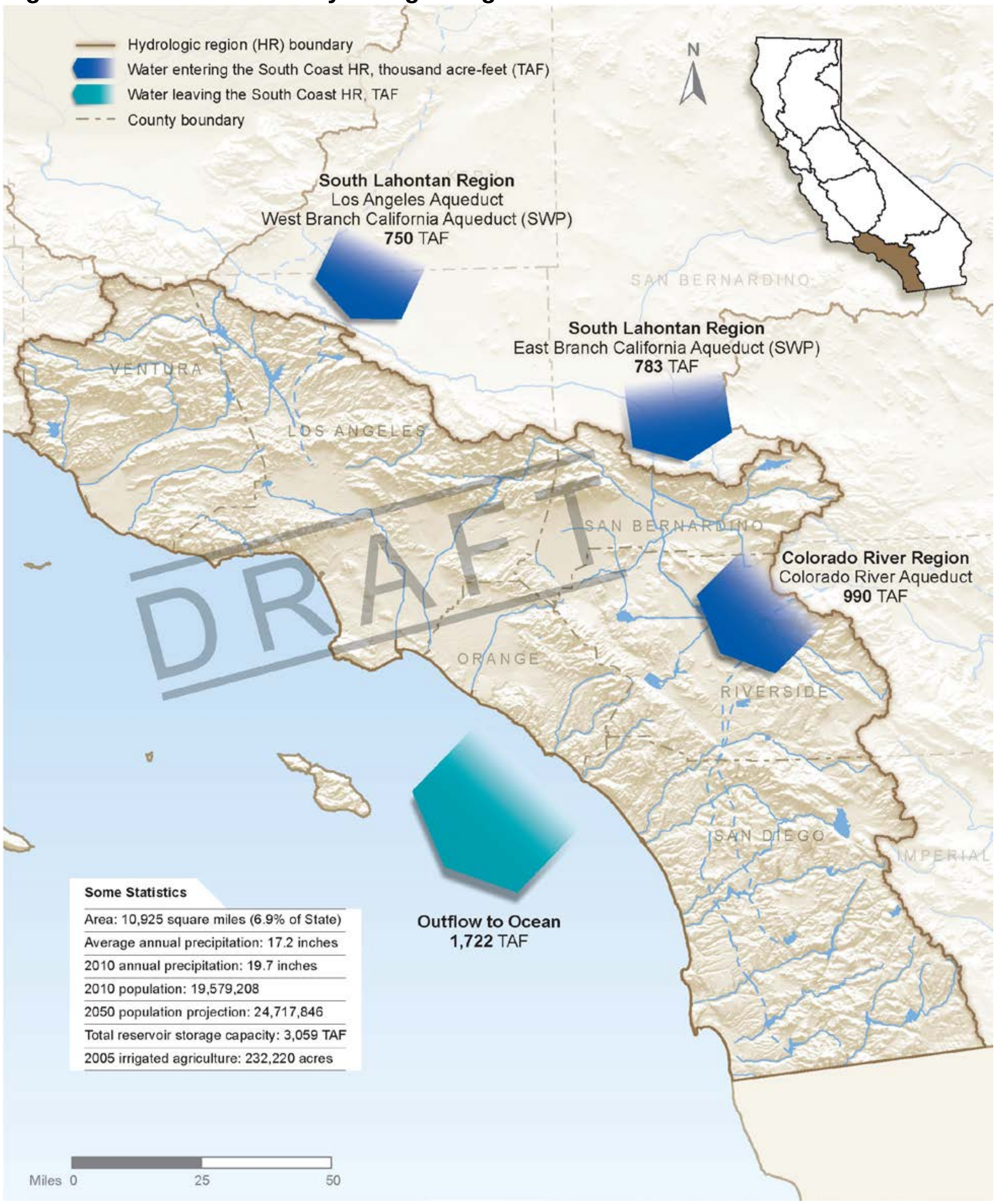
3 Gage discontinued 2004

4 Resulting from a debris wave

5 Gage discontinued 2007

6 Data source not USGS

Figure SC-4 South Coast Hydrologic Region Inflows and Outflows in 2010



Source: Department of Water Resources

Figure SC-6 Change in Urban Water Demand, South Coast Hydrologic Region

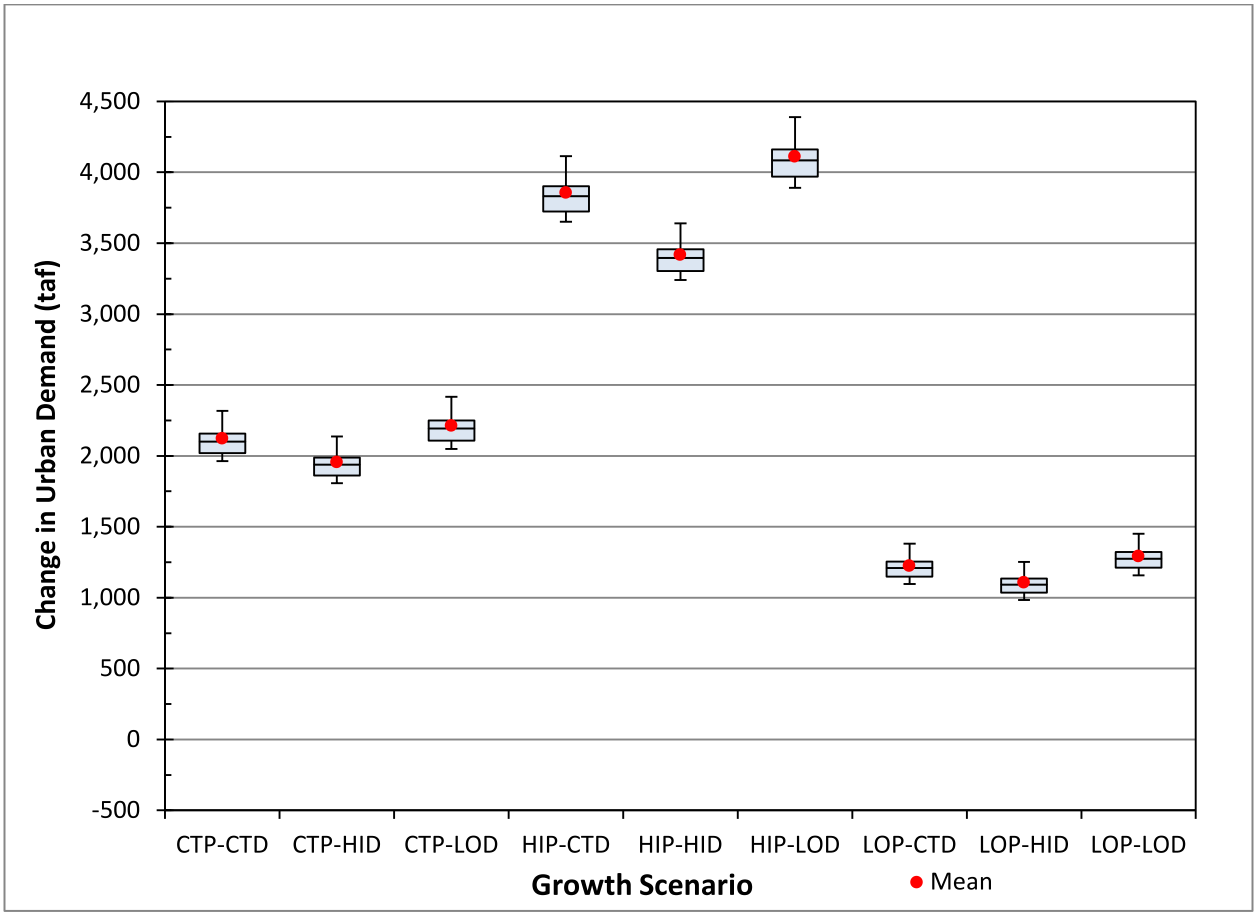


Figure SC-7 Change in Agricultural Water Demand, South Coast Hydrologic Region